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ENGINEERING & COMPLIANCE DIVISION	APPL. NO. 385555-385567	Date 05/25/01
APPLICATION PROCESSING AND CALCULATIONS	Processed By C. S. Bhatt	Reviewed By

PERMIT TO CONSTRUCT

COMPANY NAME AND ADDRESS:

Pegasus Power Partners, LLC
89 Head Quarters Plaza, North Tower, 14th Floor
Morristown, NJ 07960

SCAQMD ID# 127954

EQUIPMENT LOCATION:

5595 Eucalyptus Avenue
Chino, CA 91710

EQUIPMENT DESCRIPTION:

SECTION D: Facility Description and Equipment Specific Conditions

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 1: R-219 EXEMPT EQUIPMENT SUBJECT TO SOURCE SPECIFIC RULES					
RULE 219 EXEMPT EQUIPMENT, COATING EQUIPMENT, PORTABLE, ARCHITECTURAL COATINGS	E1			ROG: (9) [**RULE 1113, 5-14-1999; RULE 1171, 6-13-1997**; Rule 1171, 10-8-1999]	67-2

Section H of the Pegasus Power Facility Permit, ID# 127954

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 2: INTERNAL COMBUSTION, POWER GENERATION					
System 1 : Simple Cycle Turbines					
TURBINE, GAS, UNIT NO. 1, NATURAL GAS, GENERAL ELECTRIC, MODEL LM6000 ENHANCED SPRINT, SIMPLE CYCLE, WITH WATER INJECTION, 450 MMBTU/HR, WITH A/N: 385563 GENERATOR, No. 1, 45 MW (A/N 385563)	D2 B3	C4, C5	NOx: MAJOR SOURCE	NOx: 5 PPMV (4) [RULE 2005]; NOx 110 PPMV NATURAL GAS (8) [40CFR 60 SUBPART GG]; NOx: 98.6 (INTERIM) LBS/MMSCF NATURAL GAS (1) [RULE 2012], NOx: 70.2 (START UP) LBS/HR (4) [RULE 2005]; NOx: 131.2 LB/MMCF (COMMIS), (CO: 6 PPMV (4) [RULE 1303 BACT]; CO: 2000 PPMV (5) [RULE 407]; VOC: 2 PPMV (4) [RULE 1303-BACT]; PM: 0.1 GR/SCF (5) [RULE 409]; PM: 11 LBS/HR (5) [RULE 475]; PM: 0.01 GR/SCF (5A) [RULE 475]; SOx: 150 PPMV (8) [40CFR 60 SUBPART GG]	1-1, 1-2, 12-1, 12-2, 12-3, 29-2, 40-1, 57-1, 63-1, 67-1, 73-1, 82-1, 82-2, 99-1, 99-2, 99-3, 99-4, 99-5, 195-1, 195-2, 296-1, 327-1
CO OXIDATION CATALYST, NO. 1, ENGELHARD/Johnson Mathey, 150 CUBIC FEET OF TOTAL CATALYST VOLUME A/N 385562	C4	D2			
SELECTIVE CATALYTIC REDUCTION NO. 1, ENGELHARD, WITH 800 CUBIC FEET OF TOTAL CATALYST VOLUME, HEIGHT: 50 FT; LENGTH: 20 FT; WIDTH: 12 FT. WITH AMMONIA INJECTION GRID A/N 385562	C5 B6	D2		NH_3: 5 PPMV (4) [RULE 1303-BACT]	12-4, 12-5, 12-6, 29-1, 179-1, 179-2, 195-3
STACK, TURBINE NO. 1 A/N: 385563	S7				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 2: INTERNAL COMBUSTION, POWER GENERATION					
System 2 : Simple Cycle Turbine					
TURBINE, GAS, UNIT NO. 2, NATURAL GAS, GENERAL ELECTRIC, MODEL LM6000 ENHANCED SPRINT, SIMPLE CYCLE, WITH WATER INJECTION, 450 MMBTU/HR, WITH A/N: 385564 GENERATOR, No. 2, 45 MW (A/N 385564)	D8 B9	C10, C11	NOx: MAJOR SOURCE	NOx: 5 PPMV (4) [RULE 2005]; NOX 110 PPMV NATURAL GAS (8) [40CFR 60 SUBPART GG]; NOx: 98.6 (INTERIM) LBS/MMSCF NATURAL GAS (1) [RULE 2012]; NOx: 70.2 (START UP) LBS/HR (4) [RULE 2005]; NOx: 131.2 LB/MMCF (COMMIS), CO: 6 PPMV (4) [RULE 1303 BACT]; CO: 2000 PPMV (5) [RULE 407]; VOC: 2 PPMV (4) [RULE 1303-BACT]; PM: 0.1 GR/SCF (5) [RULE 409]; PM: 11 LBS/HR (5) [RULE 475]; PM: 0.01 GR/SCF (5A) [RULE 475]; SOx: 150 PPMV (8) [40CFR 60 SUBPART GG]	1-1, 1-2, 12-1, 12-2, 12-3, 29-2, 40-1, 57-1, 63-1, 67-1, 73-1, 82-1, 82-2, 99-1, 99-2, 99-3, 99-4, 99-5, 195-1, 195-2, 296-1, 327-1
CO OXIDATION CATALYST, NO. 2, ENGELHARD/Johnson Mathey, 150 CUBIC FEET OF TOTAL CATALYST VOLUME A/N 385561	C10	D8			
SELECTIVE CATALYTIC REDUCTION NO. 2, ENGELHARD, WITH 800 CUBIC FEET OF TOTAL CATALYST VOLUME, HEIGHT: 50 FT; LENGTH: 20 FT; WIDTH: 12 FT. WITH AMMONIA INJECTION GRID A/N 385561	C11 B12	D8		NH_3: 5 PPMV (4) [RULE 1303-BACT]	12-4, 12-5, 12-6, 29-1, 179-1, 179-2, 195-3
STACK, TURBINE NO. 2 A/N: 385564	S13				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 2: INTERNAL COMBUSTION, POWER GENERATION					
System 3: Simple Cycle Turbine					
TURBINE, GAS, UNIT NO. 3, NATURAL GAS, GENERAL ELECTRIC, MODEL LM6000 ENHANCED SPRINT, SIMPLE CYCLE, WITH WATER INJECTION, 450 MMBTU/HR, WITH A/N: 385565 GENERATOR, No. 3, 45 MW (A/N 385565)	D14 B15	C16, C17	NOx: MAJOR SOURCE	NOx: 5 PPMV (4) [RULE 2005]; NOX 110 PPMV NATURAL GAS (8) [40CFR 60 SUBPART GG, NOx: 98.6 (INTERIM) LBS/MMSCF NATURAL GAS (1) [RULE 2012]; NOx: 70.2 (START UP) LBS/HR (4) [RULE 2005]; NOx: 131.2 LBS/MMCF (COMMIS), CO: 6 PPMV (4) [RULE 1303 BACT]; CO: 2000 PPMV (5) [RULE 407]; VOC: 2 PPMV (4) [RULE 1303-BACT]; PM: 0.1 GR/SCF (5) [RULE 409]; PM: 11 LBS/HR (5) [RULE 475]; PM: 0.01 GR/SCF (5A) [RULE 475]; SOx: 150 PPMV (8) [40CFR 60 SUBPART GG]	1-1, 1-2, 12-1 12-2, 12-3, 29-2, 40-1, 57-1, 63-1, 67-1, 73-1, 82-1, 82-2, 99-1, 99-2, 99-3, 99-4, 99-5, 195-1, 195-2, 296-1, 327-1
CO OXIDATION CATALYST, NO. 3, ENGELHARD/Johnson Mathey, 150 CUBIC FEET OF TOTAL CATALYST VOLUME A/N 385559	C16	D14			
SELECTIVE CATALYTIC REDUCTION NO. 3, ENGELHARD, WITH 800 CUBIC FEET OF TOTAL CATALYST VOLUME, HEIGHT: 50 FT; LENGTH: 20 FT; WIDTH: 12 FT. WITH AMMONIA INJECTION GRID A/N 385559	C17 B18	D14		NH_3: 5 PPMV (4) [RULE 1303-BACT]	12-4, 12-5, 12-6, 29-1, 179-1, 179-2, 195-3
STACK, TURBINE NO. 3 A/N: 385565	S19				

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Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 2: INTERNAL COMBUSTION, POWER GENERATION					
System 4: Simple Cycle Turbine					
TURBINE, GAS, UNIT NO. 4, NATURAL GAS, GENERAL ELECTRIC, MODEL LM6000 ENHANCED SPRINT, SIMPLE CYCLE, WITH WATER INJECTION, 450 MMBTU/HR, WITH A/N: 385566 GENERATOR, No. 4, 45 MW (A/N 385566)	D20 B21	C22, C23	NOx: MAJOR SOURCE	NOx: 5 PPMV (4) [RULE 2005]; NOX 110 PPMV NATURAL GAS (8) [40CFR 60 SUBPART GG, NOx: 98.6 (INTERIM) LBS/MMSCF NATURAL GAS (1) [RULE 2012]; NOx:: 70.2 (START UP) LBS/HR (4) [RULE 2005]; NOx: 131.2 LBS/CF (COMMIS), CO: 6 PPMV (4) [RULE 1303 BACT]; CO: 2000 PPMV (5) [RULE 407]; VOC: 2 PPMV (4) [RULE 1303-BACT]; PM: 0.1 GR/SCF (5) [RULE 409]; PM: 11 LBS/HR (5) [RULE 475]; PM: 0.01 GR/SCF (5A) [RULE 475]; SOx: 150 PPMV (8) [40CFR 60 SUBPART GG]	1-1, 1-2, 12-1, 12-2, 12-3, 29-2, 40-1, 57-1, 63-1, 67-1, 73-1, 82-1, 82-2, 99-1, 99-2, 99-3, 99-4, 99-5, 195-1, 195-2, 296-1, 327-1
CO OXIDATION CATALYST, NO. 4, ENGELHARD/Johnson Mathey, 150 CUBIC FEET OF TOTAL CATALYST VOLUME A/N 385555	C22	D20			
SELECTIVE CATALYTIC REDUCTION NO. 4, ENGELHARD, WITH 800 CUBIC FEET OF TOTAL CATALYST VOLUME, HEIGHT: 51 FT; LENGTH: 11 FT; WIDTH: 3 FT. WITH AMMONIA INJECTION GRID A/N 385555	C23 (B24)	D20		NH_3: 5 PPMV (4) [RULE 1303-BACT]	12-4, 12-5, 12-6, 29-1, 179-1, 179-2, 195-3
STACK, TURBINE NO. 4 A/N: 385566	S25				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 3: INORGANIC CHEMICAL STORAGE					
STORAGE TANK, FIXED ROOF. AQUEOUS AMMONIA, 19% SOLUTION, WITH VAPOR RETURN LINE, 10,000 GALLONS A/N 385556	D26				144-1, 157-1

BACKGROUND:

Pegasus Power Partners, LLC has proposed to install a new power plant, nominally rated for 180 MW in the City of Chino (on the California State Department of Correction property). This project is developed to meet the California's power crisis and in response to Governor's Emergency Orders (D-26-01 & D-28-01). Thus, the project will be built as per the requirements of the California Energy Commission's (CEC) 21-day emergency siting process. The power plant must begin operation latest by September 30, 2001 and the produced power has to be sold to California Department of Water Resources.

For this project the applicant has filed 9 applications (please see Table 1 for application details) on April 27, 2001, which were deemed complete on May 9, 2001 & May 17, 2001. Pegasus has also filed permit applications with CEC [as this power plant's capacity is > 50 MW] and CEC will perform the CEQA review.

For this project, applicant proposes to install 4 GE LM6000 (each rated for 45 MW) simple cycle natural gas fueled turbines. Each turbine's exhaust will be vented to a CO oxidation and Selective Catalytic Reduction (SCR) air pollution control system to reduce CO, NOx and ROG emissions to 6 ppm, 5 ppm and 2 ppm respectively at 15% oxygen to meet the BACT requirements. The ammonia slip will be at 5 ppm (@ 15% oxygen).

As the NOx emission from this facility has the potential to emit more than 10-ton per year, this facility will be in RECLAIM as well as in Title V permitting program. Applicant has field a Title V permit application to comply with this requirement. This facility will also be subject to permitting under Title V acid rain provisions.

These turbines will operate in a peaking mode as per the power grid's demand.

Table 1:– Project Application Numbers

A/N	Submittal Date	Equipment
385563	4/27/2001	Turbine #1
385564	4/27/2001	Turbine #2
385565	4/27/2001	Turbine #3
385566	4/27/2001	Turbine #4
385562	4/27/2001	CO/SCR Catalyst #1
385561	4/27/2001	CO/SCR Catalyst #2
385559	4/27/2001	CO/SCR Catalyst #3
385555	4/27/2001	CO/SCR Catalyst #4
385556	4/27/2001	Ammonia Storage Tank
385567	4/27/2001	Title V Initial Application

A/N 385563 is the lead application for the project. Following is an overall description of the entire project.

PROCESS DESCRIPTION:

New Turbines

Pegasus Power plant will install 4 new simple cycle combustion turbines at the California State Department of Correction facility in Chino. These turbines are GE LM6000 Enhanced Sprints, natural gas fueled only and rated at 45 MW each. The LM6000 turbine is a 2-shaft engine derived from the CF6-80C2 jet aircraft engine. This turbine has a chilling coil to cool the combustion air. Turbine's output shaft is coupled with a 3600 RPM generator for 60 Hz power generation. The generator is a synchronous two-pole cylindrical rotor generator with a forced air-cooling. The Enhanced Sprint version of this engine is intercooled with mist injected into both the low and high-pressure compressors for increased output and efficiency.

Water will be injected into the combustors to control NOx emissions to 25 ppm at 15% oxygen. Demineralized water will be injected into the combustor through ports in the fuel nozzle. Water injection begins when turbine reaches a load of about 7 MW

Net heat rate is approximately 9348 btu/kwh (HHV).

The generator is 60 Hz 3600 rpm, rated at 60.5 MW (at a power factor of 0.85). The generators are oversized, however, the actual maximum power output from the generators is based on the turbine output of just around 45 MW.

These turbines will operate 24 hrs./day, 7 days per week and for a maximum of 7500 hrs./year

CEMS Systems

Continuous emission monitoring in the turbine exhaust will be required for NOx, CO, NH_3 and O2. Presently, Pegasus's proposal is to install a CEMS engineered and assembled by KVB-Enterec. The O2 analyzer will be a Servomes Paramagnetic 1440C, the NOx analyzer will be a TECO 42CHL dual range, and the CO analyzer will be a TECO 48 or equivalent.

Other parameters, which will be required to be measured and recorded are: 1) the fuel use (R-2012 and 40CFR), 2) water injection rate (R-2012 and 40CFR), 3) ammonia injection rate (R-2012), 4) exhaust temperature prior to the SCR catalyst (R-2012), 5) turbine output (R-2012), 6) pressure drop across the SCR catalyst, and 7) the NOx concentration prior to the SCR catalyst (for precise control of the ammonia injection rate and determination of ammonia slip).

TABLE 2:- Gas Turbine Data

Specification	
Manufacturer	GE
Model	LM6000 Sprint
Fuel Type	Pipeline Natural Gas
Maximum Fuel Consumption	0.445 mmscf/hr
Maximum GT exhaust flow	14.96 mmscf/hr
Gas Turbine Heat Input	467.4 mmbtu/hr maximum
Maximum Gas Turbine Output	50.203 MW gross/50.003 MW net
Net Plant Heat Rate, LHV	8426
Net Plant Heat Rate, HHV	9348 Btu/kw-hr
Net Plant Efficiency (LHV)	40.5%
Unabated NOx Emission Rate	205 ppm (natural gas)

(Note:- please see Appendix A in the back for details)

Control Systems

Water Injection:

The water injection system will use demineralized water injected into the combustor through ports in the fuel nozzles. Water is supplied to the nozzles through a water manifold or premixed with fuel in a secondary manifold. Water injection begins when the turbine reaches a load of 7 MW. Maximum water flow is 55 gpm and will reduce NOx emissions from 205 ppm to 25 ppm.

CO catalyst:

Applicant has proposed the CO oxidation catalyst manufactured by Engelhard to control CO and to some extent VOC emissions from the gas turbines. This oxidation catalyst will also reduce the formaldehyde and acetaldehyde emission from the gas turbines. It will be located up stream of the SCR catalyst and is guaranteed for 90% CO reduction for 3 years or 4500 hours of operation. Under most operating scenarios, CO outlet concentrations will be 6 ppm or less (performance data shows CO outlet concentrations around 12 ppm for ambient temperature of 24°F). The pressure drop across the CO catalyst is approximately 1" water column. (SO2 to SO3 conversion rate is about 50% average).

Table 3:- CO Catalyst Data

Specification	
Manufacturer	Engelhard Corporation
Catalyst Type	CAMET metal substrate
Catalyst Volume	100-150 ft^3
Space Velocity	175,000 – 150,000 hr^{-1}
Outlet CO	6 ppm (1 hour avg) at 15% O2
Outlet VOC	2 ppm (1 hour average) at 15% O2
Minimum/Max. Operating Temp	500°F/ 1200°F

SCR

Since the proposed turbines operate in simple cycle mode, a high temperature zeolite SCR catalyst is required due to high exhaust temperature of the turbines. The SCR catalyst (NOxCAT™ ZNX™) is manufactured by Engelhard Corporation. The ammonia injection begins around 800°F. The emission guarantee is 5 ppm NOx at 15% O2 for 3 years or 4500 hours of operation, with 5 ppm NH3 slip at 15% O2. Pressure drop across the SCR catalyst is approximately 3-4". [SO2 to SO3 conversion is about 4%.]

A tempering air system will be installed to insure that the flue gas temperature does not exceed 885°F, the upper operating range of the SCR catalyst. The system will consist of a 65 HP fan, which can provide up to 75,000 lbs/hr of ambient air at 100°F into the gas turbine exhaust stream. If needed, the air will be injected into the ductwork in the area immediately downstream of the gas turbine exhaust expansion joint.

Please see next page for SCR specifications.

Table 4:- SCR Data

Specification	
Manufacturer	Engelhard Corporation
Catalyst Type	NOx-CAT VNX-HT vanadia-titania
Catalyst Volume	800 ft^3
Reactor Dimensions	50' H. x 20'L. x 12' W.
Space Velocity	Approximately 30,000 hr^{-1}
Area Velocity	0.025 ft/sec
Ammonia Injection Rate	100 lbs/hr max (19 % Aqueous ammonia)
Ammonia Slip	5 ppm 1 hour average at 15% O2
Outlet NOx	5 ppm 1 hour avg at 15% O2
SCR/CO catalyst Total Cost	Approx. $2.5 million

Note:- Applicant has not yet decided about which manufacturer [Engelhard, Cormatech or equivalent for SCR and Engelhard, Johnson Matthey or equivalent] will provide the air pollution control system.

Ammonia Storage:

Expected maximum ammonia use is about 15 gallons per hour (100 lbs/hr / 7.5 lbs/gal) for each SCR, for a total of 60 gallons per hour maximum for the 4 SCRs. At an expected average annual turbine capacity factor of 0.4 and the proposed 7500 operating hours per year, the estimated annual aqueous ammonia usage will be 180,000 gallons (7500 x 60 x 0.4). This amount of ammonia usage will result in about another 12 turnovers of the tank per year. The tanks are equipped with packed bed scrubbers for control of ammonia vapors.

EMISSIONS:

Emissions from the gas turbines are affected by several factors, most importantly, the mode of operation and ambient meteorological conditions, such as humidity, temperature, and pressure. The two basic operational modes from an emissions standpoint are start-up and baseload operation. Due to the lack of emissions control, during start ups, emissions will be higher. Once exhaust temperatures reach the operating ranges of the oxidation and SCR catalysts, emissions of NOx, CO, and ROG will be controlled to BACT levels. Pegasus has estimated that a start ups for these turbines will last 1 hour. Pegasus plans to deploy these turbines mainly during peak demand periods, therefore, demand conditions will dictate exactly how often and when the turbines operate over the course of a year. This will affect actual emissions by affecting the number of start-ups, the hours of baseload operation, and the meteorological conditions under which the turbines will operate.

For AQMD New Source Review emission offset and BACT purposes, maximum and average daily emissions on a per turbine basis need to be considered for those pollutants not subject to RECLAIM. RECLAIM NOx is evaluated for all four turbines on an annual basis in determining the necessary RECLAIM Trading Credits (RTCs).

Emission calculations of NOx, ROG, and CO are based on the exhaust concentrations and the maximum exhaust rate is determined from the applicant-supplied operating scenarios. At a given power output, stack gas flow rates increase with decreasing ambient temperature. From Appendix A in the applicant provided support binder, at a maximum gross output of about 50.203MW, and at a temperature of 24°F, stack gas flow is about 1,091,160 lbs/hr. This is used as the maximum exhaust flow rate in the calculation of emissions during 'normal' mode. The applicant has also supplied estimated exhaust rates for the other operating scenarios such as start ups and commissioning periods, which are used in the calculations of emissions during those modes.

PM10 and SOx emissions are based on heat input based emission factors (lb/mmbtu), maximum heat input rate is determined using a net heat rate of 9348 btu/kWh (HHV), and a net maximum output of 50.003 MW. This was used as the maximum heat input in the calculation of emissions during 'normal' mode. The applicant supplied estimated heat inputs for the other operating scenarios such as start ups and commissioning periods which were used in the calculations of emissions during those modes.

Please refer to Appendix A of the permit evaluation pages in the folder for the calculation details. Following is a summary:

Table 5:- Turbine Emission Factors

Pollutant	Uncontrolled	Controlled
CO	120 ppm (1)	6 ppm (2)
NOx	205 ppm (2)	25 (w/wtr. inj.)/ 5 ppm (w/wtr. inj. + SCR) (2)
PM10	0.0066 lb/mmbtu (3)	0.0066 lb/mmbtu (3)
ROG	3 ppm (1)	2 ppm (2)
SOx	0.83 lb/mmcf (4)	0.83 lb/mmcf (4)

Notes:-

(1) Applicant supplied data From Appendix A in the Binder
(2) Vendors Data
(3) Ap-42 Emission Factor Development Document, Table 3.4-1 (all loads)
(4) Form B2 factor

1. Maximum Turbine Emissions:

Applicant has assumed 1 start-up and shutdown each per day and each will last for an hour. During start-up, no controls for 10 minutes and full control after that (for NOx partial control (water inj.) for 5 minutes and full control after that. Please see next page for the maximum turbine's emissions.

Table 6:- Maximum Emissions

Pollutant	Maximum Emissions per turbine			4-Turbines
	Ppm	lbs/hr	lbs/day	lbs/day
CO	120/25/12	128.18/26.71/12.82	328.07	1,312
NOx	205/25/5	359.75/43.87/8.77	271.91	1,088
PM10	0.0066 lb/mmbtu	3.085	74.04	296
ROG	3/2	1.83/1.22	29.39	118
SOx	0.83 lb/mmcf	0.3694	8.87	35
NH_3	0/5	2.43/3.24	73.71	295

Note:- For Start up, operating scenario 1 (worst case) , [100% load, 24 deg. F ambient temp. and chiller off] data is used [exhaust flow rate = 244,784 scfm, data from Appendix A in the project binder, Page 6-6]. Please see Appendix A of permit processing pages for emission rate calculation details.

2. Start-up & Shutdown Emissions:

Assumption:- Worst Operating scenario [100% load, 24 deg. F ambient temp. and chiller off] Any given day maximum 2 turbines in start-up mode and other two in normal operation [worst case: 100% load, 24° F]. Shutdown emissions are same as the normal operation.

Table 7:- Start-up Emissions Rate per turbine

Load/Pollutant	CO, lb/hr	NOx, lb/hr	PM10, lb/hr	ROG, lb/hr	SOx, lb/hr
0-10 min.	128.18	359.75	3.085	1.83	0.3694
10-15 min.	26.71	43.87	3.085	1.22	0.3694
15-60 min	12.82	8.77	3.085	1.22	0.3694
Avg. Startup Rate	33.21	70.2	3.085	1.325	0.3694

Note:- Please see Appendix A for the Avg. start-up rate calculations

2A. Composite Start-up Rate from operation of all 4 turbines:

Applicant has proposed that any given day 2 turbines will be in start-up mode and the other 2 will be in normal operation. Table 8 on next page shows the composite start-up rates and the other averaging period values. These data will be used for modeling analysis.

Table 8:- Composite start-up emissions

Pollutant	Max. Start-up Emission, lb/hr	Max. Normal Emissions, lb/hr	Composite Max. start-up Emission, lb/hr	Other Averaging Period, lb/hr		
			1-hour	8 hrs.	24 hrs.	Annual
CO	33.21	12.82	23.02	14.10	---	---
NOx	70.2	8.77	39.48	---	---	8.77
PM10	3.085	3.085	3.085	---	3.085	3.085
ROG	1.325	1.22	1.273	---	---	---
SOx	0.3694	0.3694	0.3694	---	---	---
NH_3	2.43	3.24	2.835	---	---	---

Composite Start-up rate for CO = [(2 turbines x 33.21 lb/hr) + (2 turbines x 12.82)]/4 turbines = 23.02 lb/hr
Composite Start-up rate for NOx = [(2 turbines x 70.2 lb/hr) + (2 turbines x 8.77)]/4 turbines = 39.48 lb/hr
Composite Start-up rate for ROG = [(2 turbn. x 1.325 lb/hr) + (2 turbines x 1.22)]/4 turbines = 1.273 lb/hr
Composite Start-up rate for NH_3= [(2 turbn. x 2.43 lb/hr) + (2 turbines x 3.24)]/4 turbines = 2.835 lb/hr
CO (8-hr avg.):- {[2 turb. x 33.21 lb/hr x 1 hr.] + [2 turb. x 12.82 lb/hr x 7 hrs.] + [2 turb. x 12.82 lb/hr x 8 hrs]}/(4 turb. x 8 hrs.) = 14.10 lb/hr
Annual averages for NOx and PM10 are the maximum daily values {8.77 lb/hr & 3.085 lb/hr} as these are higher than the annualized values.

3. Commissioning Period Emissions:

Applicant will commission one turbine at a time and the estimated commissioning period for each turbine is 96 hrs. There will be no NOx, CO and ROG control [water injection and scr/oxidation catalyst will not be fully operational] and turbine is not optimally tuned. Thus, there will be higher emissions during commissioning period.

It is assumed that Turbines will be commissioned in the morning hours and for the first 60 hours, it will operate at 50% load [ambient temp. @ 66 deg. F, exhaust flow rate = 167,063 scfm (from Appendix A, Page6-6, Scenario 8)]. 11 through 60 hrs. (for 50 hrs.) turbine will operate at 50 % load, [114 deg. F, exhaust flow rate 134,046 scfm, Scenario 13] and from 61st hour. to 96th hour (for 36 hrs) it will operate as per Scenario #5 [100% load, 66 deg. F, 232,237 scfm (worst case of the normal ambient condition]. Further, from 0 to 10 hrs turbine will be fired with no water injection & SCR, 11 through 60 hrs. water injection will be operational but no SCR, and from 61st to 96th hrs. turbine will operate with full control.

Table 9:- Commissioning Period Emissions

Pollutant	0-10 hrs.	11 to 60 hrs	61 to 96 hrs	Total of 1 turbine, lbs.	Total of 4 turbines, lbs.
CO	875	351	219	1,445	5,780
NOx	2,456	1,201	300	3,957	15,828
PM10	16	87	107	210	840
ROG	13	50	63	126	504
SOx	2	10	13	25	100

4. Normal Operation [100% load, 66 deg. F, full control, Operating Scenario #5]

Maximum Turbine Emissions @normal mode operation [100 % load @ 66 deg. F (this scenario is more representative of normal operation and has the highest heat input of 450.9 mmbtu/hr)]
Operating hrs. = 24 hrs/day Annual hrs. = 7,500 hrs/yr

Table 10:- Maximum uncontrolled and controlled Emission per turbine

Pollutant	Maximum Uncontrolled/ (Controlled) Emissions					
	ppm	lb/hr	lb/day	lb/mmbtu	lb/yr (contrl.)	Ton/yr (contrl.)
CO	25/ (6)	25.33/ (6.08)	607.9/ (145.9)	0.0562/ (0.0135)	45,600	22.8
NOx	25/ (5)	41.62/ (8.32)	998.9/ (199.7)	0.0923/ (0.0185)	62,400	31.2
PM10	---	2.976	71.42	0.0066 lb/mmbtu	22,320	11.16
ROG	3/2	1.74/ (1.16)	41.76/ (27.84)	0.00386/ (0.00257)	8,700	4.35
SOx	---	0.3561	8.55	0.83 lb/mmcf	2,671	1.34

Note:- daily emissions are as per 24 hrs/day and annual emissions are as per 7500 hrs/yr. See Appendix A for calculations.

Table 11:- Maximum uncontrolled and controlled Emission all four turbines

Pollutant	Maximum Uncontrolled/ (Controlled) Emissions (4 turbines' total)			
	lb/hr	lb/day	lb/yr (contrl.)	Ton/yr (contrl.)
CO	101.32/ (24.32)	2,432/ (584)	182,400	91.2
NOx	166.48/ (33.28)	3,996/ (799)	249,600	124.8
PM10	11.904	286	89,280	44.64
ROG	6.96/ (4.64)	167/ (111)	34,800	17.4
SOx	1.424	34	10,680	5.34

5. 30 Day Average Emissions for Non-RECLAIM Pollutants

The 30 Day Average emissions estimates assumes the following operational scenario:

For CO, PM10, ROG and SOx:

One month consists of 30 days, 720 hours. The turbines will undergo 1 start up event per day, lasting 1 hour each, for a total of 30 hours per month per turbine.

The commissioning period lasts 96 hours. For the remaining hours the turbines will operate under 'normal' mode @ maximum load. As per this operation logic (commissioning period, start-up and max. normal load), results in higher emission estimate and will be used as 30-day averages for above four pollutants.

Table 12:- 30 Day Average Emissions and Required Offsets

Pollutant	30 Day Average Emissions, 1 Turbine	Offset Factor	Required Offsets, 1 Turbine	Required Offsets, 4 Turbines
	Lbs/day		lbs/day	Lbs/day
CO	202	1.2	242	968
PM10	74	1.2	89	356
ROG	29	1.2	35	140
SOx	9	1.2	11	44

Note:- please see Appendix A for calculation details

6. RECLAIM Annual Average NOx Emissions

Annual average NOx emissions are estimated for the purposes of determining the required RTCs for the 1st year of operation pursuant to Rule 2005. The annual NOx estimation assumes each turbine operates 365 days per year, with 365 hours per year of start ups (1 start per day, 1 hour per start), 96 hours of commissioning and the remaining hours of operation (7,039) in 'normal' mode, maximum load. The following table summarizes the calculations:

TABLE 13:– Annual Average NOx Emissions – 4 Turbines

Operating Scenario	Annual Operation[1]	Annual Emissions[1]
	Hrs/yr	lbs/yr
Commissioning	384	15,828
Start Ups	1,460	102,492
Normal Operation	28,156	246,928
	Total	365,248

Notes:

(1) Total of 4 turbines

EVALUATION:

PART 1 SCAQMD REGULATIONS

CEQA:- Since the applicant has proposed to install SCRs for NOx emissions control and the need for an ammonia tank, issues of ammonia transportation to the project site, transfer & emissions control will trigger CEQA evaluation. The California Energy Commission (CEC) is involved with this project and will review the CEQA requirements as per Governor's Executive Order, D-26-01.

RULE 212 – Standards for Approving Permits

The new gas turbines at Pegasus facility are considered a significant project under this rule due to the fact that the emissions exceed the daily maximums specified in subdivision (d). Therefore, public notice is required to be sent to 1) all addresses within a ¼ mile radius of the project, 2) it will be published in a local newspaper, and 3) it will be sent to those parties listed in subdivision (g) of the rule, including EPA Region IX, CARB, chief executives of both the city and county of San Bernardino, any comprehensive regional land use planning agency, and affected State and Federal Land Managers.

Public Notice Requirements:

This project is subject to the noticing requirements of paragraph (g). This paragraph requires that notification follow the procedures of 40 CFR51, Section 51.161(b), and 40 CFR124, section 124.10. Rule 212(g) also requires 1) the AQMD analysis and information submitted by the operator must be available for public inspection in an area near the source, 2) notice by prominent advertisement in the affected area, and 3) mailing a copy of the notice to EPA, CARB, chief executives of the city and county where the source is located, any land use agencies, State and Federal Land Managers or Indian Governing Body whose lands may be affected by the project.

In addition to the above, Section 124.10 requires that the notice be sent to Federal and State agencies with jurisdiction over fish, shellfish, and wildlife resources and over coastal zone management plans, the Advisory Council on Historic Preservation, State and Historic Preservation Officers.

The applicant must also distribute the notification to all addresses within a ¼ mile radius of the facility.

The required public notice period under this rule is 30 days.

Rule 218 – Continuous Emission Monitoring

Each of the turbines will be required to install a CO CEMS to verify emissions of CO meet the hourly and daily emission limits. The CO CEMS will need to comply with the requirements of Rule 218, and the facility will need to submit a CEMS application for AQMD review and approval prior to installing the CEMS.

RULE 401 – Visible Emissions
Visible emissions are not expected under normal operating conditions of the turbines.

RULE 402 – Nuisance
Nuisance problems are not expected under normal operating conditions of the turbines.

RULE 403 – Fugitive Dust
This rule requires use of best available control measures to minimize fugitive dust formation from "active operations" including but not limited to, earth moving, construction, and vehicular movement. The rule prohibits active operations from causing visible emissions that extend beyond the facility's fence line. The applicant will use best available control measures during construction of the turbines. Compliance is expected.

RULE 407 – Liquid and Gaseous Air Contaminants
This rule limits the CO emissions to 2000 ppm max, and the sulfur content of the exhaust to 500 ppm for equipment not subject to the emission concentration limits of 431.1. Since the turbines are subject to the limits of Rule 431.1, only the 2000 ppm limit of this rule applies. It is expected that the equipment will be able to meet the CO limit with the use of an oxidation catalyst. Compliance will be verified through CEMS data.

RULE 409 – Combustion Contaminants
The rule limits PM emissions to 0.1 gr/scf at 12% CO_2. The equipment is expected to meet this limit at maximum firing loads based on the calculations shown below:

Estimated exhaust gas volume	14.96 mmscf/hr
Maximum PM emissions	3.085 lbs/hr natural gas firing
Estimated CO_2 % in exhaust gas	3%

Grain loading

$$\text{Natural Gas Firing} = \frac{3.085 \text{ lbs/hr } (7000 \text{ gr/lb})}{15.3 \text{ E+06 scf/hr}} \times 12/3$$

$$= 0.00565 \text{ gr/scf}$$

Compliance will be verified through the initial performance test.

RULE 431.1 – Sulfur Content of Natural Gas
The rule requires that gas fired equipment meet a sulfur content limit of 40 ppm on a 4 hour averaging time. Applicant has proposed to use commercial grade natural gas, which will is expected to meet this limit.

RULE 475 –Electric Power Generating Equipment

This rule applies to power generating equipment greater than 10 MW installed after May 7, 1976. Requirements are that the equipment meet a limit for combustion contaminants (combustion contaminants are defined as particulate matter in AQMD Regulation I) of 11 lbs/hr or 0.01 gr/scf. Compliance is achieved if either the mass limit or the concentration limit is met. Mass PM10 emissions from the Pegasus turbines are estimated at 3.08 lbs/hr, and 0.00565 gr/scf during natural gas firing (see calculations under Rule 409 discussion). Therefore, compliance is expected. Compliance will be verified through the initial performance test.

REGULATION XIII – New Source Review

The Pegasus power project is subject to the offsets, modeling, and BACT requirements of New Source Review. Following is a discussion of each requirement.

1. Offsets

Offsets for Non-RECLAIM pollutants are based on a calendar monthly average in accordance with Rule 1306(b). Required offsets are shown in Table 12 above. Offsets will be required prior to issuing the permit, however Pegasus has not yet provided the offsets for this project. Potential offset sources for this project are purchased ERCs, ARB bank and the priority reserve as outlined in Rule 1309.1.

2. Modeling

Modeling is required for CO and PM10 emissions per Rule 1303(b). Rule 1303 requires that through modeling, the applicant must substantiate that the project does not exceed any state or national ambient air quality standards at any receptor location in the District. Maximum project impacts of CO and PM10 emissions were determined using the ISCST model, version 00101 and the Pomona meteorological data. Table 14 below shows the applicable standards for the subject pollutants, and the results from Pegasus' modeling analysis.

TABLE 14:- New Source Review Modeling

Pollutant	Averaging Time	Significant Change in Air Quality Concentration	Start Up, $\mu g/m^3$	Background $\mu g/m^3$	Predicted Total $\mu g/m^3$	Most stringent Air Quality Std, $\mu g/m^3$
CO	1-hour	1,100 ug/m^3	35.03	11,452	11,487	23,000
	8-hour	500 ug/m^3	14.454	7,444	7,458	10,000
PM10	24-hour	2.5 ug/m^3	1.408	208	N/A	50
	Annual Geometric Mean	1 ug/m^3	0.190	65	N/A	30

Notes: *Maximum impacts occur during start-ups from all turbines*

The model was reviewed by AQMD modeling staff and deemed acceptable (refer to memo from Henry Hogo to Pang Mueller dated 5/15/2001, included as an attachment to this evaluation, Appendix I). Reference Appendices B through E for a more thorough discussion.

3. BACT

BACT is defined in AQMD Rule 1301 as follows:

BACT means the most stringent emission limitation or control technique which:

(1) has been achieved in practice for such category or class of source; or
(2) is contained in any State Implementation Plan (SIP) approved by the US EPA for such category or class of source. A specific limitation or control technique shall not apply if the owner or operator of the proposed source demonstrates to the satisfaction of the Executive Officer or designee that such limitations or control technique is not presently achievable; or
(3) is any other emission limitation or control technique, found by the Executive Officer or designee to be technologically feasible for such class or category of sources or for a specific source, and cost effective as compared to measures as listed in the Air Quality Management Plan (AQMP) or rules adopted by the District Governing Board.

This definition of BACT is consistent with the federal LAER definition.

The California Air Resource Board published a document entitled Guidance for Power Plant Citing and Best Available Control Technology, dated September 1999. In it, they summarize required BACT for simple cycle power plants as follows:

TABLE 15:– Required BACT

NOx	CO	VOC	PM10	SOx
5 ppmvd @ 15% O2, 1 hour rolling average	6 ppmvd @ 15% O2, 3 hour rolling average	2 ppmvd @ 15% O2, 1 hour rolling average OR 0.0027 lbs/MMbtu, HHV	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 scf	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 scf (no more than 0.55 ppmvd @ 15% O2)

Source: CARB, Guidance for Power Plant Citing and Best Available Control Technology, dated September 1999.

Pegasus is proposing the following BACT levels for this project. Note that these levels generally represent guaranteed emissions under baseload operating conditions.

TABLE 16 – Pegasus Power Project's Proposed BACT

NOx	CO	VOC	PM10	SOx
5 ppmvd @ 15% O2, 1 hour rolling average	6 ppmvd @ 15% O2, 1 hour rolling average	2 ppmvd @ 15% O2, 1 hour rolling average	Primary use of natural gas fuel limited to 16 ppm sulfur.* Use of low sulfur diesel as emergency back up limited to 15 ppm sulfur.	Primary use of natural gas fuel limited to 16 ppm sulfur.* Use of low sulfur diesel as emergency back up limited to 15 ppm sulfur.

* Natural gas provided by the Gas Company is limited to 16 ppm in the South Coast by Rule 431.1. Generally, the actual sulfur content is much lower (16 ppm corresponds to 1 gr/100 scf). Pegasus has proposed the use of natural gas with sulfur content of 0.25 grain per 100 scf.

The proposed control levels meet BACT requirements for all criteria pollutants. See discussion under Rule 2005 for more detailed analysis of BACT for NOx.

Ammonia Emissions

Rule 1303(a)(1) requires the use of BACT for ammonia emissions. The 1999 CARB BACT guidance recommends ammonia BACT levels for large gas turbines set at not more than 5 ppm. Pegasus is proposing to meet the required 5 ppm ammonia slip limit based on the manufacturer guarantee from Engelhard. Permit conditions will require measurement of the ammonia injection rate and the NOx concentrations before and after the SCR. The exhaust rate is calculated by the CEMS. Ammonia slip is then calculated based on the equation in condition 195.

RULE 1401 – Carcinogenic Air Contaminants

Pegasus ran a Tier 4 modeling analysis using ISCST version 00101 and Pomona meteorological data, along with ACE2588 Risk Assessment model version 93288, to determine health risk impacts.

Results show that the MICR is 0.07584 in a million, which is below the Rule 1401 threshold limits of 1 in a million and 10 in a million. This MICR value includes impacts from all 4 turbines. Calculated Acute Hazard Index was 0.10408, less than the rule limit of 1.0. Additionally, the Chronic Hazard Index was 0.07584 also less than the rule limit of 1.0. Cancer risk and hazard index analysis included carcinogenic emissions from all 4 new gas turbines.

The model was reviewed by AQMD modeling staff and deemed acceptable. Below is a summary of results, reference Appendix G for emission rates used as model inputs.

TABLE 17 – Results of Health Risk Assessment

MICR ($X10^{-6}$)	Acute Hazard Index	Chronic Hazard Index
0.07584	0.10408	0.05253

Note:- The above impacts are from operation of all 4 turbines.

REGULATION XVII – Prevention of Significant Deterioration

The South Coast Basin where the project is to be located is in attainment for NO2 and SO2 emissions.

Rule 1702 defines a new source where the potential to emit is at least 100 or 250 tons of attainment air contaminants per year, depending on source category. Pegasus Power project is not a major stationary source as per definition of R-1702 (m) and the PTE for NOx and SOx emissions will be about 125 tpy increase in NOx and a 5 tpy increase in SO2 (includes emissions from all four turbines). Therefore, PSD analysis in not required.

However, applicant has performed the PSD analysis for NO2 and it seems to meet the required std. Although a formal review of the modeling report was not conducted, the results presented here are for informational purposes only.

Finally, the impacts on Class I areas were analyzed. The Class I areas within 100 km of the project are as follows:

Cucamonga Wilderness Area (21 km)
San Gabriel Wilderness Area (30 km)
San Jacinto Wilderness Area (85 km)
San Gorgonia Wilderness Area (61 km)
Agua Tibia Wilderness Area (84 km)

Impacts of NO2 on these areas were modeled. The results as summarized in the table below show that maximum impacts are below the PSD Class I Increment for all pollutants in all areas.

TABLE 18 – Criteria Pollutant Impacts in Class I Areas

Pollutant	PSD Class I Increment	Cucamonga	San Gabriel	San Gorgonia	Agua Tibia	San Jacinto
	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
NO2 Annual	2.5	0.018	0.011	0.004	0.003	0.003

A regional haze analysis was conducted for these areas, with the results presented below:

TABLE 19 – Regional Haze Analysis Results

Class I Area	Percent Change in Extinction	Number of Days with >5% Change
Cucamonga WA	2.26%	0
San Gabriel WA	1.86%	0

All visibility impacts are below the acceptable change limits.

AQMD modeling staff has reviewed the modeling and determined the analysis was conducted appropriately (see memo from Henry Hogo to Pang Mueller dated 5/15/01). Reference Appendix E for emission rates used as model inputs.

RECLAIM Rules:

Rule 2001:- Pegasus will opt to enter into NOx RECLAIM (NOx emissions will be over the 4 ton/yr threshold) and will be duly entered into RECLAIM program as per requirements of R-2001 (f) and will be assigned a compliance cycle. This facility's SOx emissions will be over 4 tons/yr, however it will be exempt from SOx RECLAIM as this facility will be exclusively using natural gas {R-2000 (58)}.

Rule-2002:- This being a new RECLAIM facility, NOx allocations will be equal to the total RTCs provided by the facility to offset NOx emissions increase pursuant to R-2005.

Rule 2004:- Pegasus will comply with allocations, reporting , variance and breakdowns requirements of this rule.

Rule 2005 – NSR for Reclaim:- Rule 2005 applies to the NOx emissions from the turbines. The rule requires new sources to provide RTCs, perform a modeling analysis, and comply with BACT. Each of these requirements is discussed in further detail below.

1. RTCs

Rule 2005(b)(2)(A) requires that a new facility provide sufficient RTCs to offset emissions prior to the first year of operation on a 1-to-1 basis. Furthermore, paragraph (b)(2)(B) states that the RTCs must comply with the zone requirements of Rule 2005(e). The Pegasus turbines are expected to begin operation around September 30, 2001, and since the facility is located in Zone 2, RTCs may be obtained from either Zone 1 or 2, or both. The total required RTCs are shown in Table 13. RTCs must be provided before issuing the permit, however, at this point Pegasus has not provided any RTCs for this project.

2. Modeling

Modeling is required for NOx emissions per Rule 2005(c)(1)(B). Rule 2005 requires that through modeling, the applicant substantiate that the project does not cause a violation nor make significantly an existing violation of the state or national ambient air quality standard at any receptor location in the District [as per revised Rule 2005, April 20, 2001]. Maximum project impacts of NOx emissions were determined using the SCREEN3 model for 1 hour impacts, and ISCST model for the annual standard.

The following tables show the results from the Pegasus modeling analysis, which was conducted for both a single turbine and the combined operation of all 4 turbines. Reference Appendix E.

TABLE 20:- NOx Modeling Results, Single Turbine

Pollutant	Operating Scenario	Pegasus Model Results
1 Hour NO_2	Start up of each turbine	5.23, 5.24, 5.23, 5.21
Annual	Normal Operation	0.133, 0.134, 0.134, 0.133

Note:- Commissioning period and normal operation 1-hour modeling results are not shown here as commissioning period is a one time only short operating period and normal operation emissions are less than the start-up emissions [a composite start-up emission rate (2 turbines in start-up mode and two in normal mode) was used for the above modeling analysis. Even NOx emissions at 25 ppm under worst case (100% load 24°F) will have the 1-hour modeled impact 68.37 $\mu g/m^3$, which when added to worst case background of 305 $\mu g/m^3$ (total impact = 373.37 $\mu g/m^3$) will pass the most stringent air quality standard of 500 $\mu g/m^3$.

TABLE 21:- New Source Review NOx Modeling Results, 4 Turbines

Scenario	Model Results	Exceed Rule 2005 Significance Thresholds?	Exceeds CAAQS?
2 CTs under start-up operation and 2 CTs in normal operation at any time of the day	62.77	Yes	No
Worst case operating condition:- NOx @ 25 ppm, 100% load, 24°F	68.37	Yes	No
4 CTs under normal operation at any time of the day	12.62	No	No

Ref.:- Data from Rick Matar's e-mail, dated 5/152001

The construction commissioning occurs only once during the life of the project, after installation, in order to tune the combustors and emission control equipment. The commissioning period will last approximately 96 hours.

The table shows that even for the worst case scenario when all 4 turbines operate at 25 ppm (No SCR), modeled impact will exceed significant change in air quality concentration, however, it will not violate most stringent air quality standard. Modeling analysis for plume visibility is required by Rule 2005 (or Rule 1303) because one of the Class I areas (Cucamonga Wilderness Area) is within the prescribed distance. Table 16 on Page 30 in the applicant provided binder shows that no adverse plume impact on visibility occurs as the total contrast value (Delta E) is less than 2 and plume contrast value is less than 0.05. The results of this analysis are summarized below.

Table 22:- Plume Visibility Analysis Summary as per R-2005

Class I Area	Threshold = Distance in km	2.0 Delta E	0.05 Contrast	5% Regional Haze Max Chang %
Cucamonga Wilderness	21	1.25	0.008	2.26
San Gabriel Wilderness	30	1.96	0.016	1.86
San Gorgonio Wilderness	61	---	---	0.98
San Jancinto Wilderness	84	---	---	0.96
Aqua Tibia Wilderness	85	---	---	1.06
Joshua Tree National Monument	108	---	---	0.74

Note:- Applicant performed Regional Haze Analysis, using Calpuff model, as per request of Mr. McCorison of US Forest Service. The results of the analysis are summarized in the last column of the above table.

3. BACT

Pegasus has chosen to use an SCR control system in conjunction with water injection to control NOx emissions of the turbines. The turbine emissions will meet a 5 ppm NOx level on a 1 hour basis, this level is deemed to meet the BACT requirements for this project.

4. Additional Requirements for Major Sources

Rule 2005 requires that a major source also comply with the following:

1. Certify that all major sources in the state under control of the applicant are in compliance with all applicable federal emissions standards.

2. Submit an analysis of alternative sites, sizes, production processes, and environmental control techniques for the proposed source.

3. Conduct a visibility analysis if NOx emissions are over 40 tpy and the location of the source relative to a Class I area is within the distances specified in Table 4-1 of the rule.

Pegasus has 1) certified on the 400-A form that all major sources under their control in the state comply with federal regulations, 2) done an alternative analysis under the CEQA process, and 3) source location is within the specified distances of a Class I area. (A regional haze analysis was conducted for the new sources.) Therefore, the above 3 requirements have been met.

Rule 2012 – Monitoring Recording and Record Keeping for RECLAIM

The Pegasus facility will operate in compliance with all monitoring, record-keeping, and reporting requirements of Reclaim for the existing facility. The new turbines will be classified as major sources for RECLAIM purposes. As such each turbine will be required to have a NOx CEMS and a fuel meter, and emissions must be reported through an RTU on a daily basis. Pegasus has 12 months from the date of installation of the turbines to install the required monitor and have them certified. The facility must submit a CEMS application and plan for AQMD review and approval prior to receiving final certification on the CEMS.

Regulation XXX – Title V

The Pegasus facility will be subject to the Title V requirements as facility's PTE emissions are above the threshold. The initial Title V permit will be processed simultaneously and the required public notice will be sent along with R-212 public notice. EPA is also afforded the opportunity to review and comment on the project within a 45-day review period. The Title V public notice will be combined with the Rules 212 notice.

Public Notice:

Rule 3006:

In addition to the parties receiving the notice under Rules 212 and 1710, Rule 3006 requires the notice be sent to those who request in writing to be on a list and other means determined by the EO to insure adequate notice to the affected public. Rule 3006 also requires that the notice contain the following:

i) The identity and location of the affected facility;
(ii) The name and mailing address of the facility's contact person;

(iii) The identity and address of the South Coast Air Quality Management District as the permitting authority processing the permit;
(iv) The activity or activities involved in the permit action;
(v) The emissions change involved in any permit revision;
(vi) The name, address, and telephone number of a person who interested persons may contact to review additional information including copies of the proposed permit, the application, all relevant supporting materials, including compliance documents as defined in paragraph (b)(5) of Rule 3000, and all other materials available to the Executive Officer that are relevant to the permit decision;
(vii) A brief description of the public comment procedures provided; and,
(viii) The time and place of any proposed permit hearing that may be held or a statement of the procedures to request a proposed permit hearing if one has not already been requested.

Title V also allows for a 45 day review and comment period by the EPA.

A copy of the notice and the mailing list of those sent the notice is included in this file.

PART 2 STATE REGULATIONS

California Environmental Quality Act (CEQA)
California Energy Commission, as per Governor's emergency order guide lines, No. D-26-01 will review the EIR. There will be an ammonia storage tank at this facility, which shall be addressed per CEQA/CEC procedures.

PART 3 FEDERAL REGULATIONS

40CFR Part 60 Subpart GG – NSPS for Gas Turbines
NSPS applies to the Pegasus turbines since the heat input is greater that 10.7 giga joules per hour at peak load. Actual unit rating is $467.40(10^6)$ btu/hr x 1055 joules/btu = 493 giga joules/hr. The standards, which will be applied to the turbine are as follows (see Appendix J for the calculations):

NOx = 109.5 ppm natural gas firing
SOx = 150ppm

Additional requirement of subpart GG are the measurement of water injection rate, fuel consumption, NOx, SOx, and O2 emissions (continuous monitoring by Method 20), as well as a performance test within 60 days of installation. The NOx BACT limit of 5 ppm will apply at all times (except start ups during which there will be an alternate mass emission limit). Therefore, compliance with NSPS emission limits is expected. Additionally, compliance with the NSPS monitoring requirements is expected.

40CFR Part 63 – NESHAPS

EPA is in the process of establishing a NESHAPS for gas turbines, a draft rule was expected in November 2000, with promulgation in 2002. Until the NESHAPs is promulgated, turbine MACT standards must be evaluated on a case-by-case basis. For this project, the HAPs emissions from the 4 turbines will be below the major source thresholds of 10 tpy for a single HAP or 25 tpy for a combination of HAPs. Therefore, these turbines are not considered major sources of HAP. However, the turbines will have CO catalysts, which have been shown to reduce HAP emissions, and will most likely be the basis for the MACT standards.

40CFR Part 64 - Compliance Assurance Monitoring

The CAM regulation applies to major stationary sources, which use control equipment to achieve a specified emission limit. The rule is intended to provide "reasonable assurance" that the control systems are operating properly to maintain compliance with the emission limits. The turbines are major sources for NOx, CO, and VOC emissions, and will be subject to a BACT limit for each of these pollutants. Control equipment in the form of an SCR will be used to comply with the NOx limit, while an oxidation catalyst will be used to meet the CO limit. The VOC BACT limit will be met through the use of natural gas fuel and efficient combustion design. Therefore, the CAM rule applies to NOx and CO emissions, however, there is no add-on control equipment used to meet the VOC limit, and CAM would not apply for this pollutant.

Compliance with the BACT limits for NOx and CO will be based on CEMS, and the exemption of 64.2(b)(vi) (continuous compliance determination method) therefore applies.

Additionally, the NOx RECLAIM cap is exempt from CAM by 64.2(b)(iv) (emission trading programs).

40CFR Part 72 – Acid Rain Program

The acid rain program is similar to RECLAIM in that facilities are required to cover SO2 emissions with "SO2 Allowances" (similar to RTCs), or purchases of SO2 on the open market. The plant is also required to monitor SO2 emissions through use of fuel gas meters and gas constituent analysis (use of emission factors is also acceptable in certain cases) or with the use of exhaust gas CEMS. It is expected that Pegasus will comply with the monitoring requirements of the acid rain provisions with the use of gas meters in conjunction with gas analysis. Applicant has initiated the Title IV Phase II permit application process.

Public Notice Requirements

This project is subject to public notice under Rule 212 and Rule 3006 and public notice requirements for each rule are discussed under that rule.

RECOMMENDATION:

Following 1) the conclusion of the 30 day public notice and the 45-day EPA review periods, and subject to any comments received during these periods, and 2) upon receiving sufficient ERC and RTCs to offset emissions from the project, it is recommended that a Permit to Construct be issued. The project's facility shall include the turbines, SCRs, and the associated equipment in Section H of the facility permit. The following conditions shall apply:

CONDITIONS:

FACILITY CONDITIONS:

F2-1 The operator shall limit emissions from this facility as follows:

Contaminant	Emission Limit
NOx	Less than or equal to 142 tons in the first year

The emission limit applies based on a calendar year basis for the compliance year of 2001, 2002 and 2003. The turbine shall be on-line by Sept. 30, 2001 as specified in Governor Davis Executive Orders D-24-01 and D-28-01 or other date specified by a subsequent Executive Order to qualify for ARB ERC Bank. In the event the turbines meet the Executive Order on-line date, the offsets obtained from the ARB ERC Bank will become invalid, and prior to start of the turbine, Pegasus shall provide RTCs in the amount of 340,156 lbs for the first compliance year.

The NOx offsets obtained through the ARB ERC Bank shall expire on Nov. 1, 2003. Prior to the expiration of the NOx offsets, Pegasus Power shall provide RTCs in the amount of 352,788 lbs for the compliance period of Nov. 1, 2003 through Oct. 31, 2004. This facility permit in its entirety shall become invalid if adequate RTCs are not provided prior to Nov. 1, 2003.

[Rule 2005, 4-9-1999, Rule 2005, 4-20-2001]

F9-1 Except for the open abrasive blasting operations, the operator shall not discharge into the atmosphere from any single source of emissions whatsoever any air contaminant for a period or periods aggregating more than three minutes in any one hour which is:

(a) As dark or darker in shade as that designated No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines; or

(b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subparagraph (a) of this condition.

[Rule 401, 3-2-1984, Rule 401 9-11-1998]

Device Conditions: (Turbine)

1-1 The operator shall limit the fuel usage to no more than 1,280 MM cubic feet in any calendar month.

For the purpose of this condition, fuel usage shall be defined as the total natural gas usage of all four turbines.

[Rule 1303 (b)(2)-offset, 5-10-1996]

1-2 The operator shall limit the fuel usage to no more than 13,350 MM cubic feet in any one year.

For the purpose of this condition, fuel usage shall be defined as the total natural gas usage of all four turbines.

The operator shall maintain records in a manner approved by the District, to demonstrate compliance with this condition.

[Rule 1303 (b)(2)-offset, 5-10-1996]

12-1 The operator shall install and maintain a non-resettable totalizing fuel flow meter to accurately indicate the fuel being supplied to the turbine.

[Rule 1303(b)(2) – offset, 5-10-1996, Rule 1303(b)(2) offset, 10-20-2000, Rule 2012, 40CFR60 subpart GG]

12-2 The operator shall install and maintain a measuring device to accurately indicate the water to fuel ratio of the turbine.

[Rule 2012, 40CFR60 Subpart GG]

29-1 The operator conduct source tests for pollutants identified below:

Pollutant	Required Test Method	Averaging Time	Test Location
CO	District Method 100.1	1 hour	Outlet
NOx	District Method 100.1	1 hour	Outlet
PM	District Method 5.2	1 hour	Outlet
ROG	Approved District Method	1 hour	Outlet
SOx	District Method 6.1	1 hour	Outlet
NH_3	District Method 5.3, 207.1 or EPA Method 17	1 hour	Outlet

The test shall be conducted within 60 days of the approval of the source test protocol, but no later than180 days after initial start-up of the turbines. to the test.

The test shall be conducted to determine the oxygen levels in the exhaust. In addition, the test shall measure the fuel flow rate (CFH), the flue gas flow rate, and the turbine generating output (MW).

The test shall be conducted in accordance with a District approved source test protocol. The protocol shall be submitted to the District engineer no later than 45 days before the proposed test date and shall be approved by the District before test commences. The test protocol shall include the proposed operating conditions of the turbine during the test, the identity of the testing lab, a statement from the testing lab certifying that it meets the criteria of R-304, and a description of all sampling and analytical procedures.

The test shall be conducted when this equipment is operating at loads of 100%, 75% and 50% of maximum load.

The District shall be notified of the date and time of the test at least 10 days prior to the test. [Rule 1303 (a)(1)- BACT, 5-10-1996, Rule 1303 (b)(2) Offsets, Rule 2005]

29-2 The operator shall conduct source tests for the pollutants identified below:

Pollutants	Required Test Method	Averaging Time	Test Location
NH3	District Method 5.3 and 207.1 or EPA Method 17	1 hour	Outlet

The test shall be conducted at least quarterly during the first 12 months of operation of the SCR, and at least annually thereafter.
The test shall be conducted to determine the NH3 emissions at the outlet. The NOx concentration, as determined by the CEMS, shall be simultaneously recorded during the ammonia slip test. If the CEMS is inoperable, a test shall be conducted to determine the NOx emissions using District method 100.1.
The test shall be conducted to demonstrate compliance with the Rule 1303 concentration limit.
The test shall be conducted when the equipment is operating at 80 percent load or greater.
The test shall be conducted and the results submitted to the District within 45 days after the test date.
[Rule 1303 – BACT]

40-1 The operator shall provide to the District a source test report in accordance with the following specifications:

Source test results shall be submitted to the District no later than 60 days after the source test was conducted.

Emission data shall be expressed in terms of concentration (ppmv), corrected to 15 percent oxygen, dry basis.

All exhaust flow rate shall be expressed in terms of dry standard cubic feet per minute (DSCFM) and dry actual cubic feet per minute (DACFM).

All moisture concentration shall be expressed in terms of % corrected to 15%.

Emission data shall be expressed in terms of mass rate (lbs/hr). In addition, solid PM emissions, if required to be tested, shall also be reported in terms of grains per DSCF.

Emission data shall be expressed in terms of lbs/mmcf.

Source test results shall also include turbine fuel flow rate under which the test was conducted.

Source test results shall also include turbine and generator output under which the test was conducted.

[Rule 1303 – Offsets, Rule 1303 – BACT, Rule 2005]

57-1 The operator shall vent this equipment to the SCR and CO control catalysts whenever the turbines are in operation.

[Rule 2005]

63-1 The operator shall limit emissions from this equipment as follows:

Contaminant	Emissions Limit
CO	6,053 LBS IN ANY 1 MONTH
PM10	2,071 LBS IN ANY 1 MONTH
ROG	855 LBS IN ANY 1 MONTH
SOx	248 LBS IN ANY 1 MONTH

For the purposes of this condition, the operator shall calculate monthly emissions by using monthly fuel use data, and the following emission factors: ROG - 2.70 lbs/mmscf, PM10 - 6.93 lbs/mmscf, and SOx - 0.83 lbs/mmscf. Compliance with the CO emission limit shall be verified through CEMS data.

[Rule 1303 – Offsets]

67-1 The operator shall keep records, in a manner approved by the District, for the following parameters or items:

Fuel use during the commissioning period.

[Rule 2012]

73-1 The operator may, at his discretion, choose not to use ammonia injection when the inlet exhaust temperature to the SCR reactor is 800 Deg F or less, not to exceed 1 hour during start ups.
[Rule 1303 – BACT, Rule 402]

82-1 The operator shall install and maintain a CEMS to measure the following parameters:

CO concentration in ppmv
Concentrations shall be corrected to 15 percent oxygen on a dry basis
The CEMS will convert the actual CO concentrations to mass emission rates (lbs/hr) and record the hourly emission rates on a continuous basis.
The CEMS shall be installed and operated in accordance with an approved AQMD Rule 218 CEMS plan application. The operator shall not install the CEMS prior to receiving initial approval from AQMD.

The CEMS shall be installed and operated to measure CO concentration over a 15 minute averaging time period.
[Rule 1303 – BACT, Rule 218]

82-2 The operator shall install and maintain a CEMS to measure the following parameters:

NOx concentration in ppm
The CEMS shall be installed and operating no later than 12 months after the initial start-up of the turbine. During the interim period between the initial start-up and the provisional certification date of the CEMS, the operator shall comply with the monitoring requirements of Rule 2012(h)(2) and 2012(h)(3). Within 2 weeks of the turbine start-up date, the operator shall provide written notification to the District of the exact date of start-up.
[Rule 2012]

99-1 The 5 ppm NOx emission limit shall not apply during startup or the commissioning period. Startup shall not exceed 1 hour/day. The commissioning period shall not exceed 96 operating hours from the initial start-up. Only one turbine shall be commissioned at any one time. The operator shall provide the AQMD with written notice of the start-up dates. The 5 ppm NOx limit shall apply at all other operating times.
[Rule 2005]

99-2 The 6 ppm CO emission limit shall not apply during startup or the commissioning period. Startup shall not exceed 1 hour/day. The commissioning period shall not exceed 96 operating hours from the initial start-up. Only one turbine shall be commissioned at any one time. The operator shall provide the AQMD with written notice of the start-up dates. The 6 ppm CO limit shall apply at all other operating times.
[Rule 1303 – BACT]

99-3 The 98.58 lbs/mmscf NOx emission limit shall only apply during the interim reporting period to report RECLAIM emissions. The interim reporting period shall not exceed 12 months from the initial start-up date.
[Rule 2012]

99-4 The 70.2 lbs/hr NOx emission limit shall only apply during turbine start-ups. Start-up shall not exceed 1 hour per day. No more than two turbine shall be in start-up mode simultaneously any given day.
[Rule 2005]

99-5 The 131.16 lbs/mmcf NOx emission limit shall only apply during commissioning period and the commissioning period shall not exceed 96 hours per turbine.

193-1 The operator shall operate and maintain this equipment as follows:

In order to insure compliance with the Rule 2005 modeling requirements for allowable Significant Change in Concentration, the operator shall not start all 4 turbines simultaneously at any time. The operator shall maintain records of the date and time of each turbine start up for a minimum of 5 years.
[Rule 2005]

195-1 The 5 ppm NOx emission limit is based on a 1 hour average, at 15 percent oxygen, dry.
[Rule 2005]

195-2 The 6 ppm CO emission limit is based on a 1 hour average, at 15 percent oxygen, dry.
[Rule 1303 – BACT]

296-1 This equipment shall not be operated unless the operator demonstrates to the Executive Officer that the facility holds sufficient RTCs to offset the prorated annual emission increase for the first compliance year of operation. In addition, this equipment shall not be operated unless the operator demonstrates to the Executive Officer that, at the commencement of each compliance year after the first compliance year of operation, the facility holds sufficient RTCs in an amount equal to the annual emission increase.
[Rule 2005]

327-1 For the purposes of determining compliance with District Rule 475, combustion contaminant emissions may exceed the concentration limit or the mass emission limit listed, but not both limits at the same time.
[Rule 475]

SCR Conditions

12-4 The operator shall install and maintain a continuous monitoring system to accurately indicate the ammonia injection rate of the ammonia injection system.

The operator shall also install and maintain a device to continuously record the parameter being measured.
The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.
[Rule 1303 – BACT, Rule 2012]

12-5 The operator shall install and maintain a temperature gauge to accurately indicate the temperature in the exhaust at the inlet to the SCR reactor.

The operator shall also install and maintain a device to continuously record the parameter being measured.
The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.
[Rule 2012]

12-6 The operator shall install and maintain a pressure gauge to accurately indicate the pressure across the SCR catalyst bed in inches water column.

The operator shall also install and maintain a device to continuously record the parameter being measured.
The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.
[Rule 2012]

179-1 For the purpose of the following condition numbers, continuous monitoring shall be defined as measuring at least once every hour, and shall be based upon the average of the continuous monitoring for that hour.

Condition number 12-4, 12-5
{Rule 1303 – BACT, Rule 2012]

179-2 For the purpose of the following condition numbers, continuous monitoring shall be defined as measuring at least once every month, and shall be based upon the average of the continuous monitoring for that month.

Condition number 12-6
{Rule 2012]

195-3 The 5 ppmv NH3 emission limit are averaged over 60 minutes at 15 percent O2 dry. The operator shall calculate and continuously record the NH3 slip concentration using the following: NH3(ppmv)=[a-b*c/1E6]*1E6/b, where a=NH3 injection rate (lb/hr)/17(lb/lb mole), b = dry exhaust gas flow rate(lb/hr)/29(lb/lb mole), and c = change in measured NOx across the SCR (ppmvd at 3 percent O2). The operator shall install and maintain a NOx analyzer to measure the SCR inlet NOx ppm accurate to within +/- 5 percent calibrated at least once every 12 months.

[Rule 1303-BACT]

Appendix A

Criteria Pollutant Calculations

Gas Turbine Data for Table 2:

Data: (Ref.:- Appendix A, Page 1-6, in the application binder)

Net heat rate (LHV)	8426 btu/kWh
Net heat rate (HHV)	9348 btu/kWh
LHV	946 btu/scf
HHV	1050 btu/scf
Rated Turbine Output (100% load, 24°F, 47%RH)	50.003 MW
Exhaust flow (@ 47% RH, 24°F)	303 lbs/s (1,091,160 lbs/hr)

1. Maximum Heat Input (HHV) = 9348 btu/kw-hr x 50,003 kw = 467.43 mmbtu/hr

2. Maximum Exhaust Flow:

   (1,091,160 lbs/hr x lb-mole/28 lbs x 384 scf/lb-mol)/1E06 = 14.96 mmscfh

3. Maximum Fuel Use, Natural Gas = 467.43 mmbtu/hr/(1050 btu/scf) = 0.445 mmcfhr

4. Net Plant Thermal Efficiency (@LHV) = 3412 btu/kw-hr/8426 btu/kw-hr = 40.5%
   (Ref. 3412 btu/kw-hr = 100 % efficiency)

Table A1. **Manufacturer Guaranteed Emissions**, Natural Gas Firing

Pollutant	Guarantee
	Ppm
NOx	205 ppm (no control) 25 ppm (water injection only), 5 ppm (water injection + SCR)
CO	6 @ 15% O_2
ROG	2 @ 15% O_2
PM10	No guarantee
SOx	No guarantee
NH_3	5 ppm @ 15% O_2

Turbine's Maximum Emission calculations for Table 6:

Worst operating condition is when the turbine operates at 24°F, 100% load, 47% RH [fuel usage = 467.43 mmbtu/hr (0.445 mmscf/hr), exhaust flow rate = 244,784 scfm, Ref. Page 6-6, Appendix A in the binder]. One start-up per day, (which last for an hour) and during Start-up, no controls for the first 10 minutes. Water injection starts at 11th minute (assumed CO & NOx emissions @ 25 ppm) and SCR/cat-Oxidation starts after 15th minute [CO & NOx @ guaranteed emissions level of 6 & 5 ppm respectively]. Shutdown emissions are same as normal base load emissions. [daily max. emissions = 1 hr. start-up emissions + 23 hrs. of max. normal operation]

CO Emissions:-

[120 ppm x 244784 scfm x 60 min/hr x 28 lb/lb-mol x lb-mol/385 scf]/E06 = 128.18 lb/hr
[25 ppm x 244784 scfm x 60 min/hr x 28 lb/lb-mol x lb-mol/385 scf]/E06 = 26.71 lb/hr
[*12 ppm x 244784 scfm x 60 min/hr x 28 lb/lb-mol x lb-mol/385 scf]/E06 = 12.82 lb/hr
{* at this max. operating conditions CO emissions are at 12 ppm (Page 4-6, Appendix A)}
[(a) 6 ppm x 244784 scfm x 60 min/hr x 28 lb/lb-mol x lb-mol/385 scf]/E06 = 6.41 lb/hr
((a) BACT Rate)

Start-up hour:-[10/60 x 128.18 (lb/hr)] + 5/60 x 26.71 (lb/hr)] + 45/60 x 12.82 hr)] = 33.21 lbs
CO Start-up Emission Rate = 33.21 lb/hr

Normal operation:- 23 hrs. x 12.82 lb/hr = 294.86 lbs
CO Maximum Daily Emissions = 33.21 + 294.86 = 328.07 lbs/day

NOx Emissions:-

[205 ppm x 244784 scfm x 60 min/hr x 46 lb/lb-mol x lb-mol/385 scf]/E06 = 359.75 lb/hr
[25 ppm x 244784 scfm x 60 min/hr x 46 lb/lb-mol x lb-mol/385 scf]/E06 = 43.87 lb/hr
[5 ppm x 244784 scfm x 60 min/hr x 46 lb/lb-mol x lb-mol/385 scf]/E06 = 8.77 lb/hr

Start-up hour:-[10/60 x 359.75 (lb/hr)] + 5/60 x 43.87 (lb/hr)] + 45/60 x 8.77 (lb/hr)] = 70.2 lbs
NOx Start-up Emission Rate = 70.2 lb/hr

Normal operation:- 23 hrs. x 8.77 lb/hr = 201.71 lbs
NOx Maximum Daily Emissions = 70.2 + 201.71 = 271.91 lbs/day

PM10 Emissions:- 0.0066 lb/mmbtu x 467.43 mmbtu/hr = 3.085 lb/hr

PM10 Maximum Daily Emissions = 3.085 lb/hr x 24 hrs/day = 74.04 lbs/day

NH_3 Emissions:- 5 ppm x244784 scfm x 60 min/hr x 17 lb/lb-mol x lb-mol/385 scf]/E06 = 3.24 lb/hr

Start-up hour = [15/60 x 0 + 45/60 x 3.24 (lb/hr)] = 2.43 lbs
NH_3 Maximum Daily Emissions = (3.24 lb/hr x 23) + 2.43 = 76.95 lbs/day

ROG Emissions:-

[3 ppm x 244784 scfm x 60 min/hr x 16 lb/lb-mol x lb-mol/385 scf]/E06 = 1.83 lb/hr
[2 ppm x 244784 scfm x 60 min/hr x 16 lb/lb-mol x lb-mol/385 scf]/E06 = 1.22 lb/hr

Start-up hour:-[10/60 x 1.83 (lb/hr)] + 50/60 x 1.22 (lb/hr)] = 1.325 lb
ROG start-up Emission Rate = 1.325 lb/hr

Normal operation:- 23 hrs. x 1.22 lb/hr = 28.06 lbs
ROG Maximum Daily Emissions = 1.325 + 28.06 = 29.39 lbs/day

SOx Emissions:- 0.83 lb/mmcf x 0.445 mmscf/hr = 0.3694 lb/hr

SOx Maximum Daily Emissions = 0.3694 x 24 hrs/day = 8.87 lbs/day

➢ **Table A2:- Start Up Emissions Summary**

	Uncontrolled, Minutes 0-10		Water Injection, Minutes 11-15		Water Inj. & SCR/Cat. Ox. Minutes 16-60		
Pollutant	Emission	Emission Rate	Emission Factor	Emission Rate	Emission	Emission Rate	Total Start Up Emissions 1 Turbine
	lbs/mmbtu	lbs/hr	Lbs/mmbtu	lbs/hr	Lbs/mmbtu	lb/hr	Lbs/start
CO	120 ppm	128.18	25 ppm	26.71	12 ppm	12.82	33.21
NOx	205ppm(2)	359.75(4)	25 ppm(2)	43.87(4)	5 ppm (2)	8.77(4)	70.20
PM10	0.0066(1)	3.085(5)	0.0066(1)	3.085	0.0066	3.085	3.085
ROG	3 ppm(2)	1.83(4)	2 ppm(2)	1.22	2 ppm	1.22	1.325
SOx	0.83(3)	0.3694(6)	0.83(3)	0.3694	0.83	0.3694	0.3694

Notes:
(1) AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)
(2) Manufacturer data
(3) Form B-2 factor
(4) Based on 244,784 scfm exhaust.
(5) Based on 467.43 mmbtu/hr fuel use
(6) Based on 0.445 mmscf/hr fuel use

Interim NOx Emission Factor (@25 ppm) = (43.87lb/hr)/(0.445 mmcf/hr) = **98.58 lb/mmcf**

Commissioning Period Emissions:-

A. 0 through 10 hrs of operation (10 hrs @ operating condition as per Scenario # 8):-

CO, lb/hr = 120 ppm x E-06 x 167,063 scfm x 60 min/hr x 28 lb/lb mole x lb mole/385 scf = 87.49
CO emissions = 87.49 lb/hr x 10 hrs = 875 lbs.

NOx, lb/hr = 205 ppm x E-06 x 167,063 scfm x 60 min/hr x 46 lb/lb mole x lb mole/385 scf = 245.56
NOx emissions = 245.56 x 10 hrs. = 2,456

PM10, lb/hr = 1.57 (Appendix B, Scenario 8)
PM10 Emissions = 1.57 lb/hr x 10 hrs. = 16 lbs

ROG, lb/hr = 3 ppm x E-06 x 167,063 scfm x 60 min/hr x 16 lb/lb mole x lb mole/385 scf = 1.25
ROG Emissions = 1.25 lb/hr x 10 hrs = 13 lbs

SOx, lb/hr = 0.83 lb/mmcf x 0.227 mmcf/hr (Appendix B, Scenario 8) = 0.188
SOx Emissions = 0.188 lb/hr x 10 hrs = 2 lbs

B. 11 through 60 hrs of operation (50 hrs. at operating condition as per Scenario # 13):-

CO, lb/hr = 25 ppm x E-06 x 134,046 scfm x 60 min/hr x 28 lb/lb mole x lb mole/385 scf = 7.02
CO emissions = 7.02 lb/hr x 50 hrs = 351 lbs.

NOx, lb/hr = 25 ppm x E-06 x 134,046 scfm x 60 min/hr x 46 lb/lb mole x lb mole/385 scf = 24.02
NOx emissions = 24.02 lb/hr x 50 hrs. = 1,201 lbs

PM10, lb/hr = 1.73 (Appendix B, Scenario #13)
PM10 Emissions = 1.73 lb/hr x 50 hrs. = 87 lbs

ROG, lb/hr = 3 ppm x E-06 x 134,046 scfm x 60 min/hr x 16 lb/lb mole x lb mole/385 scf = 1.003
ROG Emissions = 1.003 lb/hr x 50 hrs = 50 lbs

SOx, lb/hr = 0.83 lb/mmcf x 0.249 mmcf/hr (Appendix B, Scenario #13) = 0.207
SOx Emissions = 0.207 lb/hr x 50 hrs = 10 lbs

C. 61 through 96 hrs of operation (36 hrs. at operating condition as per Scenario # 5):-

CO, lb/hr = 6 ppm x E-06 x 232,237 scfm x 60 min/hr x 28 lb/lb mole x lb mole/385 scf = 6.08
CO emissions = 6.08 lb/hr x 36 hrs = 219 lbs.

NOx, lb/hr = 5 ppm x E-06 x 232,237 scfm x 60 min/hr x 46 lb/lb mole x lb mole/385 scf = 8.32
NOx emissions = 8.32 lb/hr x 36 hrs. = 300

PM10, lb/hr = 2.98 (Appendix B, Scenario #5)
PM10 Emissions = 2.98 lb/hr x 36 hrs. = 107 lbs

ROG, lb/hr = 2 ppm x E-06 x 232,237 scfm x 60 min/hr x 16 lb/lb mole x lb mole/385 scf = 1.74
ROG Emissions = 1.74 lb/hr x 36 hrs = 63 lbs

SOx, lb/hr = 0.83 lb/mmcf x 0.429 mmcf/hr (Appendix B, Scenario #5) = 0.356
SOx Emissions = 0.356 lb/hr x 36 hrs = 13 lbs

➢ **Table A4:- Commissioning Period Emissions Summary**

	Uncontrolled 0-10 hrs		Water Injection 11-60 hrs		Water Injection/SCR 61-96 hrs			
Pollutant	Emission Factor	Emission Rate	Emission Factor	Emission Rate	Emission Factor	Emission Rate	Total, 1 Turbine	Total, 4 Turbines
	lbs/mmbtu	lbs/hr	Lbs/mmbtu	Lbs/hr	lbs/mmbtu	lbs/hr	lbs	lbs
CO	120 ppm	87.49	25 ppm	7.02	6 ppm(2)	6.08(6)	1,445	5,780
NOx	205 ppm	245.56(4)	25 ppm(2)	24.02(5)	5 ppm(2)	8.32(6)	3,957	15,828
PM10	0.0066(1)	1.57(7)	0.0066(1)	1.73(8)	0.0066(1)	2.98(9)	210	840
ROG	3 ppm(2)	1.25(4)	3 ppm(2)	1.003(5)	2 ppm(2)	1.74(6)	126	504
SO2	0.83(3)	0.188(10)	0.83(3)	0.207(11)	0.83(3)	0.356(12)	25	100

Notes: *(1) AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)*
(2) Manufacturer guarantee
(3) Form B-2 Factor
(4) Based on 167,063 scfm exhaust rate
(5) Based on 134,046 scfm exhaust rate
(6) Based on 232,237 scfm exhaust flow rate
(7) data from Appendix B, Scenario 8
(8) data from Appendix B, Scenario 13
(9) data from Appendix B, Scenario 5
(10) Based on 0.227 mmcf/h fuel input
(11) Based on 0.249 mmcf/h fuel input
(12) Based on 0.429 mmcf/h fuel input

Comm. Period Avg. NOx Rate = 10/96 x (245.56) + 50/96 x (24.02) + 36/96 x (8.32) = 41.21 lb/hr
Comm. Period Avg. fuel Rate = 10/96 x (0.227) + 50/96 x (0.249) + 36/96 x (0.429) = 0.3142 mmcf/hr
Comm. Period NOx Emission Factor = (41.21 lb/hr)/(0.3142 mmcf/hr) = **131.16 lb/mmcf**

Normal Operation:-

Maximum turbine emissions @ normal mode of operation [100% load, 66°F {this operating condition is more representative of normal operation and has the highest heat input of 450.9 mmbtu/hr (0.429 mmcf/hr)}]

Operating hours = 24 hrs/day Annual Hours = 7,500 hrs./yr

CO emissions:-

CO, lb/hr, uncntrl. = 25 ppm x E-06 x 232,237 scfm x 60 min/hr x 28 lb/lb mole x lb mole/385 scf = 25.33
CO, lb/hr, cntrl. = 6 ppm x E-06 x 232,237 scfm x 60 min/hr x 28 lb/lb mole x lb mole/385 scf = 6.08

NOx Emissions:-

NOx, lb/hr, uncntrl. = 25 ppm x E-06 x 232,237 scfm x 60 min/hr x 46 lb/lb mole x lb mole/385 scf = 41.62
NOx, lb/hr, cntrl. = 5 ppm x E-06 x 232,237 scfm x 60 min/hr x 46 lb/lb mole x lb mole/385 scf = 8.32

PM10 Emissions:-

PM10, lb/hr, uncntrl./cntrl. = 0.0066 lb/mmbtu x 450.9 mmbtu/hr = 2.976 lb/hr

ROG Emissions:-

ROG, lb/hr, uncntrl. = 3 ppm x E-06 x 232,237 scfm x 60 min/hr x 16 lb/lb mole x lb mole/385 scf = 1.74
ROG, lb/hr, cntrl. = 2 ppm x E-06 x 232,237 scfm x 60 min/hr x 16 lb/lb mole x lb mole/385 scf = 1.16

SOx Emissions:-

SOx, lb/hr, uncntrl./cntrl. = 0.83 lb/mmcf x 0.429 mmcf/hr = 0.3561 lb/hr

Table A4:- Normal Operation Emission Summary

Pollutant	Maximum Uncontrolled/ (Controlled) Emissions					
	Ppm	lb/hr	Lb/day	Lb/mmbtu	lb/yr (contrl.)	Ton/yr (contrl.)
CO	25/ (6)	25.33/ (6.08)	607.9/ (145.9)	0.0562/ (0.0135)	45,600	22.8
NOx	25/ (5)	41.62/ (8,32)	998.9/ (199.7)	0.0923/ (0.0185)	62,400	31.2
PM10	---	2.976	71.42	0.0066 lb/mmbtu	22,320	11.16
ROG	3/2	1.74/ (1.16)	41.76/ (27.84)	0.00386/ (0.00257)	8,700	4.35
SOx	---	0.3561	8.55	0.83 lb/mmcf	2,671	1.34

Note:- daily emissions are as per 24 hrs/day and annual emissions are as per 7500 hrs/yr.
NOx Emission (per heat input) uncntrl. = (41.62 lb/hr)/450.9 = 0.0923 lb/mmbtu cntrl. = 8.32/450.9 = 0.0185 lb/mmbtu

30 Day Average Emissions

The 30 Day Average emissions estimate assumes the following operational scenario for CO, PM10, ROG and SOx:

One month consists of 30 days, 720 hours. The turbines will undergo 1 start up event per day, lasting 1 hour each, for a total of 30 hours per month per turbine.

The commissioning period lasts 96 hours. For the remaining hours the turbines will operate under 'normal' mode @ maximum load. As per this operation logic (commissioning period, start-up and max. normal load), emission estimates are higher and will be used as 30-day averages for above four pollutants. [96 hrs. of commissioning period + 30 hrs. of start-up + 594 hrs. of normal operation = 720 hrs./mo]. ***Also, all emissions for normal operation are calculated as per BACT limits.***

CO Emissions:-

[1,445 lbs (comm. Period, Table A3) + (33.21 lb/hr (start-up rate) x 30 hrs.) + (6.08 lb/hr (normal operation rate) x 594 hrs.)] = 1,445 + 996 + 3,612 = 6,053 lbs/mo

CO 30-day Avg. Emissions = (6,053 lb/mo)/(30 days/mo) = 202 lbs/day

PM10 Emissions:-

[210 lbs (comm. Period, Table A3) + (3.085 lb/hr (start-up rate) x 30 hrs.) + (2.976 lb/hr (normal operation rate) x 594 hrs.)] = 210 + 93 + 1,768 = 2,071 lbs/mo
PM10 30-day Avg. Emission = (2,071 lb/mo)/(30 days/mo) = 69 lbs/day
Note:- PM10 30-day Avg. per daily maximum = 3.085 lb/hr x 24 hrs/day = 74 lb/day

ROG Emissions:-

[126 lbs (comm. Period, Table A3) + (1.325 lb/hr (start-up rate) x 30 hrs.) + (1.16 lb/hr (normal operation rate) x 594 hrs.)] = 126 + 40 + 689 = 855 lbs/mo

ROG 30-day Avg. Emission = (855 lb/mo)/(30 days/mo) = 29 lbs/day

SOx Emissions:-

[25 lbs (comm. Period, Table A3) + (0.3694 lb/hr (start-up rate) x 30 hrs.) + (0.3561 lb/hr (normal operation rate) x 594 hrs.)] = 25 + 11 + 212 = 248 lbs/mo

SOx 30-day Avg. Emission = (248 lb/mo)/(30 days/mo) = 8 lbs/day
Note:- SOx 30-day Avg. per daily maximum = 0.3561 lb/hr x 24 hrs/day = 9 lb/day

Table A5:- 30-Day Average Emission Summary

Pollutant	Commissioning (96 hours)	Start-ups (30 hours)	Normal Operation (594 hours)	Total Emissions	30 Day Average Emissions, 1 Turbine	Total offsets for 4 turbines w/1.2 offset ratio
	lbs	lbs	lbs	lbs/month	lbs/day	lbs/day
CO	1,445	996	3,612	6,053	202 [x 1.2 = 242]	968
NOx	3,957	2,106	4,942	11,005	367 [x 1.2 = 440]	1,762*
PM10	210	93	1,768	2,071	74* [x 1.2 = 89]	356
ROG	126	40	689	855	29 [x 1.2 = 35]	140
SOx	25	11	212	248	9* [x 1.2 = 11]	44

** For PM10 & SOx daily maximum emissions, @ normal mode, are used as per above highlighted note and NOx data are provided for informational use only (please see RTCs calculation below).*

NOx Annual Emissions for RTCs:- 1st year

During the 1st year each turbine will have 96 hrs of commissioning period + 365 hrs. of start-ups period and the remaining hrs. [7500 – (96 + 365) = 7,039 hrs] in normal operation.

1st year NOx emissions (per turbine) = 3,957 lbs (comm. Period, Table A3) + 70.2 lb/hr x 365 hrs (start-up) + 8.77 lb/hr x 7,039 hrs = 3,957 + 25,623 + 61,732 = 91,312 lbs/yr

For 2nd year and beyond, NOx Emissions (per turbine) = 25,623 (start-up) + (7500 – 365) x 8.77 = 25,623 + 62,574 = 88,197 lbs/yr

Table A6:- NOx Annual Emission Summary

Operating Scenario	Operating hrs, hrs/yr	Annual Emission per turbine, lbs/yr	Annual Emission, all 4 turbines, lbs/yr
Commissioning period	96	3,957	15,828
Start-up period	365	25,623	102,492
Normal Operation	7,039 1st yr & 7,135 2nd yr	61,732 62,574	246,928 250,296
	Total, 1st year Total, 2nd year	91,312 88,197	365,248 352,788

Note:- the above annual NOx emissions are calculated as per normal operation at BACT level of 5 ppm

NH3 Emissions

based on 5 ppm guaranteed ammonia slip and maximum exhaust flow rate

5 ppm/E06 x 14.96 mmscfh x 17 lbs/lb-mole/(385 scf/lb-mole) = 3.30 lbs/hr

Appendix B

Modeling Summary

For the new Pegasus Power Project, the applicant performed both single source modeling (one turbine only), as well as modeling which included emissions from all four turbines operating at once under several potential scenarios (2 turbines in start-up mode and two in normal mode). A 1703 analysis was also conducted for regional haze and acid deposition impacts.

A 1401 HRA was performed for this new facility, which included emissions from all turbines.

The following table briefly describes which equipment was included in the model for each applicable regulation for each site:

Regulation	Modeled Emissions (*)
Rule 1303 NSR	Modeling was conducted using emissions from 2 turbines during start-ups and 2 in normal operation for CO and PM_{10}.
Rule 2005 NSR	Modeling was conducted for various combinations of operating scenarios & stack parameters that were conservatively selected from the turbine performance data to produce worst plume dispersion & highest impacts. Thus, emissions from 2 turbines in normal operation with other 2 turbines starting were used for NO_2
PSD*	Annual average NO_2 impacts were determined using emissions from the normal operation of all 4 turbines, 23 hrs/day, 364 days/yr, plus a daily start up. (commissioning emissions were not included).
1401 HRA	Acute HI: all 4 turbines operating at normal full load. Chronic HI and MICR: all turbines operating at normal full load throughout the year(7500 hrs/yr).

(*) PSD analysis is not required as the project's emissions are below the 250 tons/yr threshold and there is no need to perform modeling analysis.

Note:- Applicant used the composite start-up emission rates of CO, NOx and PM10 (worst case) from operation of 2 turbines in start-up mode and two turbines in normal mode. Modeling analysis was performed with a nominal emission rate of 1 gram/sec and the maximum predicated impacts were multiplied by the scenario specific rate to determine the scenario impacts for each pollutant and the corresponding averaging period.

Applicant has not performed modeling analysis for Commissioning period as it is a one-time only scenario of short duration (96 hrs).

Appendix B contd..

Emission Factors and Stack Parameters for Modeling Inputs

Emission rates used in the modeling are based on either compliance limits, estimates of exhaust concentrations, or AP-42 factors. Note that the factors used in modeling may be different than those used in the emission calculations in Appendix A.

Table B1:- Estimated Emission Concentrations and Compliance Limits

	Natural Gas Emission Concentrations	
Pollutant	Water Injection/CO catalyst	Water Injection/ SCR/CO catalyst
	ppm	Ppm
NOx	25	5
CO	6	6
ROG	2	2
PM10	no guarantee provided	no guarantee provided
SO2	no guarantee provided	no guarantee provided

The factors used to generate uncontrolled emission rates were taken from the 4/00 Version of AP-42, Section 3.4, Tables 3.4-1 (natural gas). These tables show test results from both "All Load" and "High Load" tests. The factors used are from the "All Load" tests as follows:

Table B2:- AP-42 Factors

Pollutant	Natural Gas Emission Factors
	lbs/mmbtu
NOx	0.295
CO	0.177
ROG	Note 1
PM10	0.0066
SO2	0.94S[(2)]

(1) ROG factor of 0.00206 lbs/mmbtu for natural gas firing was not used. Instead the 2 ppm manufacturer guarantee was used because it results in a higher emission estimate.

(2) where S = 4.54 ppm, or 0.00084% for natural gas.

Following are the assumptions and parameters used as inputs in the modeling of a single turbine during commissioning, normal start-up and normal operation (the hourly emission rates and stack parameters apply to all 4 turbines. (please see Appendix C on next page for details).

Appendix C

Single Source Modeling Inputs

Modeling was performed to determine impacts from a single CT's emissions during the commissioning period, start-ups, shut downs and normal operation.

Emission rates used in the modeling are based on either manufacturer data, or AP-42 factors as listed in the previous appendix. Following are the emission rates, assumptions and parameters used as inputs in the modeling. Appendix E contains the results from modeling the combined operation of all turbines.

1. Commissioning Period

Commissioning will be performed on one turbine at a time. The commissioning period is expected to last a total of 96 hours per turbine. During commissioning, emissions of NOx and CO are expected to be higher than during normal operation because the water injection, SCR, and CO control systems may not be fully operational, and the turbine combustor may not be optimally tuned.

For modeling purposes, it was assumed that during the first 10 hours there will be no NOx control. Then during the next 50 hours of testing water injection will be used. Finally, the SCR and CO catalysts will be operational for the final 36 hours of commissioning.

Table C1:- Commissioning Period Emissions Summary (Ref.:- Table A3)

	Uncontrolled 0-10 hrs		Water Injection 11-60 hrs		Water Injection/SCR 61-96 hrs			
Pollutant	Emission Factor	Emission Rate	Emission Factor	Emission Rate	Emission Factor	Emission Rate	Total, 1 Turbine	Total, 4 Turbines
	Lbs/mmbtu	lbs/hr	Lbs/mmbtu	Lbs/hr	Lbs/mmbtu	Lbs/hr	lbs	lbs
CO	120 ppm	87.49	25 ppm	7.02	6 ppm(2)	6.08(6)	1,445	5,780
NOx	205 ppm	245.56(4)	25 ppm(2)	24.02(5)	5 ppm(2)	8.32(6)	3,957	15,828
PM10	0.0066(1)	1.57(7)	0.0066(1)	1.73(8)	0.0066(1)	2.98(9)	210	840
ROG	3 ppm(2)	1.25(4)	3 ppm(2)	1.003(5)	2 ppm(2)	1.74(6)	126	504
SO2	0.83(3)	0.188(10)	0.83(3)	0.207(11)	0.83(3)	0.356(12)	25	100

Notes: *(1) AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)*
(2) Manufacturer guarantee
(3) Form B-2 Factor
(4) Based on 167,063 scfm exhaust rate
(5) Based on 134,046 scfm exhaust rate
(6) Based on 232,237 scfm exhaust flow rate
(7) data from Appendix B, Scenario 8
(8) data from Appendix B, Scenario 13
(9) data from Appendix B, Scenario 5
(10) Based on 0.227 mmcf/h fuel input
(11) Based on 0.249 mmcf/h fuel input
(12) Based on 0.429 mmcf/h fuel input

Comm. Period Avg. NOx Rate = 10/96 x (245.56) + 50/96 x (24.02) + 36/96 x (8.32) = 41.21 lb/hr
Comm. Period Avg. fuel Rate = 10/96 x (0.227) + 50/96 x (0.249) + 36/96 x (0.429) = 0.3142 mmcf/hr

Appendix C contd.

Table C2:- Stack Parameters, Commissioning Period

	Uncontrolled	Water injection	Water injection/SCR
	Hours 0-10	Hours 11-60	Hours 61-96
Stack Height (m)	33.5	33.5	33.5
Stack Diameter (m)	3.05	3.05	3.05
Stack Temp (K)	665	693	725
Stack Velocity (m/s)	25.6	21.4	38.7
Exhaust Flow (scfh)	10,023,780	8,042,760	13,934,220
Total Fuel Use (mmscf)	2.27	8.57	15.46

Note:- the above data are from Appendix A in the project binder, Scenarios #8, 13 and 5 and provided for information only. Applicant did not run modeling analysis with the above parameters for the commissioning period, however, start-up period modeled impacts [the worst case scenario with maximum impact] can be used to predict commissioning period impacts. The worst case maximum impact is 12.62 $\mu g/m^3$ from 1 g/s input from all 4 turbines [Ref.:- Rick Matar's e-mail 5/15/2001]. Thus, the commissioning period's impact can be estimated by multiplying NOx emission rate of 41.21 lb/hr (5.19 g/s) with 12.62 $\mu g/m^3$ [5.19 x 12.62 = 65.5 $\mu g/m^3$]. This modeled impact plus worst case background concentration of 305 $\mu g/m^3$ yields 370.5 $\mu g/m^3$ which is less than ambient air quality standard of 500 $\mu g/m^3$. As per revised R-2005 (4/20/2001), commissioning period NOx emissions impact complies with the standard.

Appendix C contd.

2. Start Ups

Start ups are expected to occur on a daily basis. Emissions of NOx will be higher during start ups as compared to normal operation because the SCR, and for a short time the water injection, systems will not be operational. For the first 10 minutes of a typical start up, there will be no water injection and no ammonia injection. For the next 5 minute (11 through 15th minute) water injection will commence but no ammonia injection. Between 16th minute to the 1st hour of start-up, full controls will be operational, and the turbine should be achieving 5 ppm exhaust NOx and 6 ppm exhaust CO.

Table C4:- Emission Estimates, Start-ups (Ref.:- Table A2)

	Uncontrolled, Minutes 0-10		Water Injection, Minutes 11-15		Water Inj. & SCR/Cat. Ox. Minutes 16-60		
Pollutant	Emission	Emission Rate	Emission Factor	Emission Rate	Emission	Emission Rate	Total Start Up Emissions 1 Turbine
	lbs/mmbtu	lbs/hr	Lbs/mmbtu	lbs/hr	Lbs/mmbtu	lb/hr	Lbs/start
CO	120 ppm	128.18	25 ppm	26.71	12 ppm	12.82	33.21
NOx	205ppm(2)	359.75(4)	25 ppm(2)	43.87(4)	5 ppm (2)	8.77(4)	70.20
PM10	0.0066(1)	3.085(5)	0.0066(1)	3.085	0.0066	3.085	3.085
ROG	3 ppm(2)	1.83(4)	2 ppm(2)	1.22	2 ppm	1.22	1.325
SOx	0.83(3)	0.3694(6)	0.83(3)	0.3694	0.83	0.3694	0.3694

Notes:

(1) AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)
(2) Manufacturer data
(3) Form B-2 factor
(4) Based on 244,784 scfm exhaust.
(5) Based on 467.43 mmbtu/hr fuel use
(6) Based on 0.445 mmscf/hr fuel use

Applicant performed modeling analysis using worst combinations [100% load, lowest stack temperature and exhaust velocity] of 15 different operating scenarios shown in Appendices A & B in the project binder. The resultant worst case maximum impact is 12.62 $\mu g/m^3$ from 1 g/s input from all 4 turbines [Ref.:- Rick Matar's e-mail 5/15/2001]. District's modeling staff and applicant's consultant discussed about this logic of running the modeling analysis and concluded that it will produce the maximum impact and ok to use to predict impacts from any other operating scenarios. Thus, the 1-hour impact due to start-up of a single turbine can be estimated by multiplying NOx start-up emission rate of 70.2 lb/hr (8.845 g/s) with 12.62 $\mu g/m^3$ [8.85 x 12.62 = 111.69 $\mu g/m^3$. This modeled impact plus worst case background concentration of 305 $\mu g/m^3$ yields 421.7 $\mu g/m^3$ which is less than ambient air quality standard of 500 $\mu g/m^3$. As per revised R-2005 (4/20/2001), commissioning period NOx emissions impact complies with the standard. The applicant has proposed to start only two turbines at any given time while other two are in normal mode and the composite NOx emission rate is 39.48 lb/hr (4.97 g/s) (Ref. Table 8 of permit processing pages). Under this scenario too, NOx emissions impact for 1-hour will be in compliance the revised standards [(12.62 x 4.97) + 305 = 3672.7 $\mu g/m^3$].

Appendix C contd.

3. Normal Operation

Table C5:- Emission Estimates, Normal Operation

Pollutant	Emission Factor	Emission Rate
	ppm	lbs/hr
NOx	5[2]	8.03
CO	6[2]	5.87
VOC	2[2]	1.12
PM10	0.0066[1] lbs/mmbtu	2.83
SO2	0.94S[1]	0.34[3]

Notes:
(1) AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)
(2) Manufacturer guarantee
(3) Based on 4.54 ppm, or 0.00084% w sulfur

Applicant has not shown the separate modeling analysis for the normal operation in the project binder. The input data might be in the CD, however, applicant has not shown the explicit impact from this scenario as the worst case scenario emissions comply with the standard.

4. Shut Downs

Applicant has estimated that on the average there will be one shutdown per day of 10 minutes duration and the emissions during shutdown are assumed same as normal operation. Thus, applicant has not shown a separate modeling analysis for this period.

Appendix D

Modeling Results

Following are summaries of the model results.

Commissioning, 1 Turbine: Applicant did not explicit modeling analysis for the commissioning period. It is estimated that commissioning period will comply with modeling standards. Commissioning period is a one-time, short duration operation and does not require to comply with modeling standards

Table D1:- Start Up - 1 Turbine (Turbine #2)

Pollutant	Averaging Time	Allowable Significance Change Threshold	Model Results
		$\mu g/m^3$	$\mu g/m^3$
CO	1 hour	1,100	9.291
	8-hour	500	3.715
NO_2	1 hour	20	5.236
	Avg. Annual	1	0.134
PM_{10}	24-hour	2.5	0.349
	Avg. Annual	1	0.048

Table D2:- Start Up – all four Turbines

Pollutant	Averaging Time	Allowable Significance Change Threshold	Model Results
		$\mu g/m^3$	$\mu g/m^3$
CO	1 hour	1,100	35.03
	8-hour	500	14.454
NO_2	1 hour	20	19.742
	Avg. Annual	1	0.533
PM_{10}	24-hour	2.5	1.408
	Avg. Annual	1	0.190

Normal Operation 1 Turbine:- Applicant did not show any results of this operation as emissions during normal operation are lower than start-up period and compliance will be met.

Appendix E

Rule 1703 Modeling

Since the project emissions are less than 250 tons/yr, it does not trigger federal PSD requirements. However, applicant has performed the air quality modeling, using ISCST3 model for NO_2, as the project's emissions are of significant level (more than 100 tons per year of NOx emissions). Modeling results for 1-hour and annual averaging period comply with the standards. Details are shown on Page 28 of the project binder.

The applicant also conducted a visibility impairment (haze analysis) and nitrogen deposition analysis for the 2 Class I areas within 50 km – San Gabriel and Cucamonga Wilderness areas.

The model used for the visibility analysis was CALPUFF version 5.4. Operating scenario assumed was normal operation of the 4 turbines 24 hours/day, 7500 hours per year, plus a daily start-up. Results of visibility and the haze analysis and the maximum predicted impacts at each area are shown below.

Table E1:- Visibility Analysis Results

Class I Area	Delta E	Threshold	Contrast	Threshold
Cucamonga Wilderness	1.25	2.0	0.008	0.05
San Gabriel Wilderness	1.96	2.0	0.016	0.05

Mr. Mike McCorison of US Forest Service {USFS} requested that the applicant perform a visibility (regional haze analysis for areas outside the 50 km radius, which was performed using a CALPUFF model. The following table summarizes the results of Nitrogen/sulfur Deposition, Regional Haze and Class I Significant Impact Levels

Table E2:- Summary of results of additional analysis Performed per USFS

Parameter	Cucamonga WA	San Gabriel WA	San Gorgonio WA	San Jacinto WA	Aqua Tibia WA	Joshua Tree National Monu.
Distance from site	21	30	61	84	85	108
Total Nitrogen Deposition (kg/ha-yr)	0.0021	0.00154	0.000554	0.000438	0.000435	0.000289
Total Sulfur Deposition (kg/ha-yr)	0.000382	0.000273	0.000131	0.000110	0.000109	0.0000773
Regional Haze Max. Change, %	2.26	1.86	0.98	0.96	1.06	0.74
NO2 Annual ($\mu g/m^3$)	0.0181	0.0113	0.0039	0.00329	0.00327	0.00253

Appendix F

Rule 1401 Modeling

The applicant to determine the MICR, and Chronic and Acute Hazard Indices from the operation of the new turbines performed a Health Risk Assessment.

The following operating scenarios were included in determining the emissions per turbine:

365 start ups per year (one per day)
normal operation, 24 hours per day, 7 days/week, 52 weeks/yr, 7500 hrs/yr

Max. Turbine Heat Input: 467.43 mmbtu/hr (0.445 mmscf/hr) @ 100% load, 24°F
Avg. Annual Heat input: 450.0 mmbtu/hr (0.429 mmscf/hr) @ 100% load, 66 °F

Commissioning emissions were not included as this is a one time short term operating scenario, which should have minimal impact on the long term (70 year) cancer risk basis.

The applicant estimated Toxic/Hazardous Air Pollutant emissions as per R-1401(f) guidance and a Tier 4 modeling was performed using the ISCST3 model to determine maximum cancer, acute and hazard risks from operation of this project. The emission factors were taken from the California Air Toxic Emission Factors {CATEF}, version 1.2 and the potential risks were assessed as per CAPCOA risk assessment guidelines [CAPCOA, 1993] and District Rule 1401.

Please see the table on the next page for details.

Appendix F contd.

Table F1:- Toxic Emission Factors & R-1401 Analysis Results Summary

HAP	CATEF Emission Factor (lbs/mmscf)	Each Turbine Max. Emiss., (g/s)	Each turbine Avg. Annual Emiss. (g/s)	Acute Hazard Index	Chronic Hazard Index	Max Individual Cancer Risks per million [x E-06]
Acetaldehyde	6.86E-02	3.85E-03	3.71E-03	---	0.028E-02	0.0067
Acrolein	2.73E-02	1.53E-03	1.48E-03	1.01E-01	5.0E-02	---
Ammonia	7.14E+00	4.01E-01	3.86E-01	0.016E-01	0.13E-02	---
Benzene	1.36E-02	7.63E-04	7.35E-04	7.4E-06	8.2E-06	0.0140
Benz(a)anthracene (PAH)	2.26E-05	1.27E-06	1.22E-06	---	---	0.0011
Benzo(a)pyrene (PAH)	1.39E-05	7.79E-072	7.51E-07	---	---	0.0070
Benzo(b)fluoroanthene (PAH)	1.13E-05	6.34E-07	6.11E-07	---	---	0.00057
Benzo(k)fluoroanthene (PAH)	1.10E-05	6.17E-07	5.95E-07	---	---	0.00056
1,3 Butadiene	1.27E-04	7.12E-06	6.86E-06	---	---	0.00078
Chrysene (PAH)	2.52E-05	1.41E-06	1.36E-06	---	---	0.00013
Dibenz(a,h)anthracene (PAH)	2.35E-05	1.32E-06	1.27E-06	---	---	0.0130
Formaldehyde	1.10E-01	6.17E-03	5.95E-03	0.0083E-01	0.13E-02	0.0240
Indeno(1,2,3-cd)pyrene (PAH)	2.35E-05	1.32E-06	1.27E-06	---	---	0.0012
Naphthalene (PAH)	1.66E-03	9.13E-05	8.97E-05	---	6.7E-06	---
Propylene Oxide	4.78E-02	2.68E-03	2.58E-03	1.1E-05	5.8E-05	0.0064
Toluene	7.10E-02	3.98E-03	3.84E-03	1.4E-06	8.6E-06	---
Xylene (total)	2.61E-02	1.46E-03	1.41E-03	8.4E-07	1.4E-06	
	Total (not including ammonia)	4.21E-01	4.06E-01	0.10408	0.05253	0.07584

(Note:- Data from Attachment II in the application binder)

Appendix G

Emission Factors

Table G1:- Emission Factors, Normal Operation

Pollutant	Emission Factors, Fuel Volume Basis		Emission Factors, Heat Input Basis	
	Uncontrolled	Controlled	Uncontrolled	Controlled
	lbs/mmcf	Lbs/mmcf	lb/mmbtu	lb/mmbtu
CO	283.40(1)/	59.04(2)/14.17(3)	0.270(4)	0.0562(5)/0.0135(6)
NOx	795.31(7)	97.02(8)/19.39(9)	0.7567(10)	0.0923(11)/0.0185(12)
PM_{10}	6.937(13)	6.937(13)	0.0066(14)	0.0066(14)
ROG	4.06(15)	2.70(16)	0.00386(17)	0.00257(18)
SOx	0.83(19)	0.83(19)	0.000790(20)	0.000790(20)

Notes:

(1) Based on 120 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(2) Based on 25 ppm, 13.93 mmcfh exhaust rate, 0.429 mmcfh fuel use
(3) Based on 6 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(4) Based on 120 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(5) Based on 25 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(6) Based on 6 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(7) Based on 205 ppm 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(8) Based on 25 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(9) Based on 5 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(10) Based on 205 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(11) Based on 25 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(12) Based on 5 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(13) Based on AP-42 Emission Factor Development Document, Table 3.4-1 (all loads), 13.93 mmscfh, 0.429 mmcfh fuel use
(14) Based on AP-42 Emission Factor Development Document, Table 3.4-1 (all loads)
(15) Based on 3 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(16) Based on 2 ppm, 13.93 mmscfh exhaust rate, 0.429 mmcfh fuel use
(17) Based on 3 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(18) Based on 2 ppm, 13.93 mmscfh exhaust rate, heat input of 450.9 mmbtu/hr
(19) Based on Form B2 Factor (20) Based on Form B2 Factor, heat input 450.9 mmbtu/hr

Calculations Example:
CO, lbs/mmcf = {(25 ppm x 13.93 mmscfh x 28)/385}/0.429 = 59.04
NOx, lbs/mmcf = {(205 ppm x 13.93 mmscfh x 46)/385}/0.429 mmcfh = 795.31
NOx, lbs/mmbtu = {(5 ppm x 13.93 mmscfh x 46)/385}/450.9 mmbtu/hr = 0.0185
PM_{10}, lb/mmcf = [(0.0066 lb/mmbtu) x (450.9 mmbtu/hr)]/6.937
ROG, lb/mmcf = {(2 ppm x 13.93 mmscfh x 16)/385}/0.429 = 2.70
SOx. lb/mmbtu = {0.83 lb/mmcf x 0.429 mmcf/hr}/450.9 mmbtu/hr = 0.00079

Controlled NOx Emissions = 8.32 lb/hr Net Power output (normal operation, 100% load, 66°F) = 46.231 mw

Controlled NOx Emissions, lb/mwh= 8.32/46.231 = 0.180

Appendix H

NSPS Calculations

Since turbine heat input is greater than 10.7 giga joules per hour NSPS standards apply {40CFR60 subpart GG]:

$$STD = 0.0075\frac{14.4}{Y} + F$$

Where:

STD = allowable NOx emissions in percent volume at 15%, dry
Y = manufacturer's rating in KJ/watt-hr
F = 0 for fuel with nitrogen content < 0.015%w

Maximum Fuel Input = 467.4 mmbtu/hr
Gas Turbine Output = 50.003 mw = 50,003 kw

Y = (467.43E06 btu/hr) x (1/50,003 kw) x (kw/1000 watts) x (1055 joules/btu) x (kj/1000 j)
9.8622 kj/watt-hr

STD = 0.0075(14.4/9.8622) + 0 = 0.01095%
= 109.5 ppm
110 ppm

Appendix I

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

M E M O R A N D U M

DATE: May 15, 2001

TO: Pang Mueller

FROM: Henry Hogo

SUBJECT: Review of an Air Quality Analysis and a Screening Health Risk Assessment for Salmon Energy LLC – Chino Power Plant (A/Ns 385555-56, 385559, and 385561-67)

As you requested, Planning, Rule Development & Area Sources (PRAS) staff reviewed the air quality impact analysis and the screening health risk assessment for Salmon Energy LLC – Chino Power Plant (A/Ns 385555-56, 385559, and 385561-67) by Pegasus Power Partners LLC located at 5601 Eucalyptus Avenue, Chino, CA 91710. The air quality analysis and screening health risk assessment are contained in the report entitled "Pegasus Power Partners, LLC, the Pegasus Project, Chino, California, April 2001." The report is intended to meet the requirements of New Source Review (Regulations XIII) and Rule 1401. The Chino Power Plant includes four 45 MW combustion turbine generators. Our summarized comments are given as follows and more detailed comments are presented in attachment 1.

Rules 1303– The air quality impacts from the project will be in compliance with Rule 1303.

Rule 1401 - The health impacts from the project will be in compliance with Rule 1401.

Please direct any question to Thomas Chico at Ext. 3149.

YHH

Cc: Mike Nazemi
C. S. Bhatt
John Yee
Tran Vo

pega.doc

Attachment 1

Comments on the Air Quality Analysis and the Screening Health Risk Assessment for Chino Power Plant (Pegasus Project)

Comments on the NSR (Rules 1303) Analysis

- The air quality impacts are presented as the total impact from four proposed combustion turbine generators. The applicant used EPA ISCST model (version 00101) with appropriate model options. All source parameters and emission rates are assumed to be correct. The applicant used the Pomona meteorological data for their modeling, which is appropriate for the project impact area. A 100-meter receptor spacing was used to determine the peak impacts.
- The maximum air quality impacts from the facility are presented in Table 11 and attachment II of the applicant's report. The impacts are all less than the significant thresholds in Table A-2 of Rule 1303 and therefore satisfy the requirements of Rule 1303. The impacts are also in compliance with amended Rule 1303, which was revised on April 20, 2001. Under the revised rule, the project impacts must be less than the most stringent ambient air quality standards for NO_2, CO, and PM10. The applicant needs to follow the requirements of amended Rule 1303. The background concentrations for all relevant pollutants in the area should be provided. The background concentrations should be the highest value of monitored data available in most recent three-year period.
- There are two wilderness areas within the distance listed in Table C-1, Rule 1303. The applicant performed a level 2 visibility analysis for Cucamonga and San Gabriel wilderness areas. The results indicate that they will comply with 1303 as presented in Attachment II.
- **Summary** –The applicant performed their air quality analysis per District's modeling requirements. The air quality impacts from the proposed project will be in compliance with Rule 1303.

Comments on the Heath Risk Assessment (i.e., Rule 1401) Analysis

- A HRA was prepared for the facility (i.e., the four proposed combustion turbine generators) in accordance with the District's guidelines.
- The applicant used EPA ISCST model (version 00101) with appropriate model options. All the source parameters and emission rates are assumed to be correct. The applicant used the Pomona meteorological data for their modeling, which is adequate for the project impact area. A 100-meter receptor spacing were used to determine the peak impacts.
- A spreadsheet was used to estimate the health impacts from the proposed project. The cancer risk is estimated to be 0.075 in one million (0.075×10^{-6}). The acute and chronic hazard indices are estimated to be 0.1 and 0.05, respectively. The health impacts from the proposed facility will be in compliance with Rule 1401.
- **Summary** – The applicant performed their health risk assessment per District's HRA procedures. The health impacts from proposed project will be in compliance with Rule 1401.